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BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
RANGE RESEARCH

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BRANCH OF RESEARCH

February, 1931

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ALLEGHENY FOREST EXPERIMENT STATION

General

Interest in a study of forest influence on streamflow has been found to be strong. The Pittsburgh Flood Commission and Chamber of Commerce are eager for new light on this subject. Secretary Charles E. Ryder of the Water and Power Resources Board, and water engineer of the Department of Forests and Waters of Pennsylvania, said that he had often discussed a study of this subject with Major Stuart while the latter was State Forester. The most surprising support for the study, to our way of thinking, has been among the foresters of the region. Forbes' talk on the need for influences studies in the East before the Allegheny Section meeting was commented upon enthusiastically.

Forbes addressed the Retail Lumber Dealers' Association of Western Pennsylvania in annual session at Pittsburgh, and spoke informally at the annual meeting of the Pulpwood Department of the American Paper and Pulp Association in New York City. Wood presented a brief summary of the accomplishments of the Experiment Station at the annual meeting of the Allegheny Section, Society of American Foresters, at which Forbes was elected chairman for the ensuing year. Hough, Schnur, and Wood spoke jointly before the Botanical Society of Pennsylvania on "Methods of Forest Research".

At a staff meeting, held to assist Messrs. Hatch and Doak in the selection of the important tree species of the region on which to study mycorrhiza, some very interesting conclusions were reached. A list of both hardwoods and softwoods in the Allegheny territory was drawn up, and each species was rated according to its commercial value and its abundance in the territory. An Arabic numeral was put opposite each species; 1 opposite those of high commercial value, 2 opposite those of medium value, and 3 opposite those of low value. Roman numerals were placed opposite the same trees in the following order: I, abundant; II, fairly common; and III, rare. Both Arabic and Roman numeral 1, or a total of 2 points, were thus assigned to only three species: white oak, chestnut oak, and hard maple. A total of 3 points were assigned to beech, red maple, red gum, hemlock, white pine, pitch pine, loblolly pine, and white cedar. A total of 19 hardwoods and 10 softwoods were listed by the members of the staff as being of importance in the territory, either because of the value of their wood or their occupancy of important areas. Whatever may have been the situation in the past, there can be no question that today the Allegheny territory is important chiefly for its hardwoods.

Hough and Wood have been pushing the emergency building program on the Kane Forest. What we don't know about drilling a well apparently would fill a volume, and so far as we can judge from

(over)

our efforts to obtain help from other units of the Forest Service, plans for ranger's dwellings and field laboratories have hitherto been drawn on somebody's cuff, and the shirt laundered!

The gloom has been thickest, however, around our efforts to bring the Capper Report economic data up to date. We shall of course have to depend almost entirely on the State authorities for even intelligent guesses.

Management

Former Student Assistant McComb submitted from State College, Pennsylvania, a very interesting report on the chestnut oak seedlings grown from large and small acorns at Camp Ockanickon. Although the data are meager, and the method of conducting the original experiment is open to criticism, there can be no question but that at the end of the first season the seedlings from the heavier acorns are markedly superior. McComb picked the leaves off each seedling individually, and traced them on a sheet of paper, later obtaining the leaf surface by a planimeter; he also weighed the leaves. A study of his data for the various lots of seedlings shows a rather remarkable uniformity in the weight per area of leaf surface. Should this uniform ratio hold for leaves from larger plants, in which sun forms and shade forms are of course intermingled, a simple method of arriving at total leaf surface in transpiration and other studies is at once suggested. McComb's figures also suggest none too good a correlation between shoot height and total weight of the plant; this is sobering when one considers that the only measurement it is feasible to make in plantations is that of shoot height.

Mensuration

Schnur finished drafting the alinement charts for mine prop (anthracite) weights. In preparing these he has thrown together in one group red maple, beech, and chestnut; in another sugar maple, black and yellow birches; in a third oak; and in the fourth black cherry.

Special Studies - Mycorrhiza

When suitable photographic apparatus prove unavailable in the Botany Department, Hatch obtained what he needed in the Zoology Department, and has been photographing mycorrhizal formation on seedlings brought from Sweden. In addition to beginning work on a working plan for the mycorrhizal project, he visited both the New Jersey Agricultural Experiment Station and the Boyce Thompson Institute. He was received very cordially at both places, and in

addition to receiving many helpful suggestions in technique, has made arrangements for the trial of some very expensive apparatus at Yonkers, New York. This apparatus is for the continuous aeration and proper cooling of tree seedlings raised in sterile flasks, with and without mycorrhiza.

Types

Hough has continued the analysis of the data from the virgin tract on East Tionesta, tabulating basal areas, and summarizing data on height classes and advance reproduction.

Morey has completed the analysis of seedlings, and the preparation of butt taper curves, necessary to obtaining total ages for trees of different breast high diameters in Heart's Content. The problem here is how to reconstruct the past history of a stand which is in part nearly 500 years old. This must be done from a tally of diameters in a part of the stand still in existence, and stump ring counts in another part which was cut within the last two years. Whether this can be done without carrying speculation and hypothesis to an absurd degree remains to be seen, but at least we have learned what must be done in the East Tionesta tract if we are to correctly interpret its history.

Wood completed a memorandum covering the available age data in the virgin forest at Cooksburg, where the main white pine stand appears to be more even-aged than in Heart's Content, and where there are a few relicts of a very much older stand - 400 years or more.

Pathology

General Forest Tree Diseases
Assignment: L. W. R. Jackson

Damping-off project: Several laboratory experiments were completed on the effect of pH on the incidence of damping off coniferous seedlings. The seedlings were grown in nutrient solutions with the following pH values, 2.5, 3.5, 4.5, 5.5, 6.5, and 7.5. At the proper growth stage the seedlings were inoculated with either Pythium or Rhizoctonia. Each culture consisted of a one liter pyrex beaker containing 900 cc of solution and 25 seedlings. A striking relationship has been found between the acidity of the solution and the growth and development of the young seedlings.

A nutrient solution has been developed which is stable at all pH values between 2.5 and 8.5 Considerable difficulty has been experienced with moldy seeds in the germinators. Douglas fir has an unusually large amount of mold material on the seed coats and as a rule the germinators are filled with mold growth before the seeds germinate. On the

other hand western yellow pine seed is practically free from mold material and the germinators rarely show any mold growth. Disinfectants such as mercury have been avoided for fear they might be carried along into the cultures and thereby seriously interfere with inoculations. Calcium hypochlorite was tried but failed with Douglas fir. To date the most promising method is as follows: Scour the seed coats with wet quartz sand by shaking violently in a flask for at least 15 minutes. It is advisable to change the sand and water several times.

Sprout hardwoods decay project: Several conferences have been held with foresters in this region for the purpose of locating areas which will be suitable for study. At present we have at hand several prospective areas of sprout hardwood copice, principally oak. Excellent cooperation on the location of these areas has been had from the foresters in this region.

Nursery cooperation project: Cooperative work is being carried on with the Delaware State Nursery and Monongahela Nursery at Parsons, West Virginia. This work consists chiefly of recommendations for the control of seed-bed diseases.

A diagnosis was made of diseased seedling material from the Baily Nursery at St. Paul, Minnesota.

Disease survey project: Plans are being made for an index system for this survey. The project has been discussed with several foresters in this region who have expressed a great deal of enthusiasm.

Mycorrhiza
Assignment: K. D. Doak

Mycorrhiza project: Activities on the mycorrhiza project have included the following investigations:

1. Development of suitable methods of seed sterilization and handling for use in sterile culture work.

2. Investigation of mycorrhiza collections made in November at College Park, Maryland, Camp Ockanickon area and other points.

3. Development of methods for collecting, handling and culturing mycorrhiza material in the field

Seed sterilization tests were made with mercuric chloride, hydrogen peroxide, concentrated sulphuric acid and calcium hypochlorite. Plantings were made on potato dextrose agar following treatment. Pre-treatment in 70 per cent alcohol was found necessary to obtain complete wetting of the seed coat in most cases. As far as possible the occurrence of contaminants was observed at short intervals. Germination counts were made after 15 days on the agar plates. Chestnut

seeds (Castanea japonica and C. Mollissima) were placed in one liter Erlenmeyer flasks on agar after treatment. The following table summarizes the results on sterilization:

Seeds	Treatment	Number of seeds	Percentage sterile	Germination per cent
White pine	$Ca(Cl\,O)_2$ 30 min.	137	89.7	64
White pine	H_2SO_4 cone	170	80.0	56.1
White pine	$HgCl_2$ (1-1000 (4 min.	235	65.2	39.0
Western yellow pine	$Ca(Cl\,O)_2$ (30 min.	170	98.5	60
Western yellow pine	H_2O_2 (3%) (35 min.	69	100	62.3
Douglas fir	$Ca(Cl\,O)_2$ (35 min.	57	87.7	42.1
Douglas fir	H_2O_2(3%) (35 min.	92	61.2	71
Scotch pine	$Ca(Cl\,O)_2$ (30 min.	145	98.6	13.1
Castanea japonica	$Ca(Cl\,O)_2$ 30 min.	40	69.5	86.9
Castanea mollissima	$Ca(Cl\,O)_2$ 30 min.	40	60	100

It was found necessary to remove seed coats of chestnuts before sterilization in order to eliminate seeds having visible internal infections. Although complete sterilization is desirable, it is possible to pick seeds for transfer from plates or flasks having some contamination. There is additional danger that seeds placed on an agar surface may show no contamination due to the fact that only a small portion of the surface comes in actual contact with the agar. It was concluded that calcium hypochlorite (10 grams $Ca(Cl\,O)_2$ in 140 cc water) was the most desirable sterilizing agent for this purpose.

For field collections of mycorrhizas and roots a modified Rawlings, killing, fixing and preserving solution, which gave satisfactory results with various kinds of roots collected during November, 1930, will be used. A few preliminary experiments with Amanita muscaria, Boletus piperatus, an unknown mycorrhiza-former from basswood, and a slow-growing unknown black fungus indicate that Trommer's malt agar will be the most satisfactory medium for field isolation work. This was compared with potato dextrose agar, dextrose agar, prune agar, prune dextrose agar, and liquid malt. It is considered that only a solid medium could be used satisfactorily for field isolation.

Preparations of mycorrhiza collected in November, 1930, from the College Park, Maryland, Nursery, Camp Ockanickon area and other points have been made by the paraffin method. These will be used for critical microscopic investigative and for comparison with material collected later from other points. The mycorrhiza of oriental chestnuts (Castanea japonica and C. mollissima) from the U. S. Plant Introduction Gardens have been sectioned by the same method and are being studied in detail. Both of these showed ectotrophic mycorrhizas resembling those of the oaks. Radial elongation of the outer cell layer occurred on one side of the roots and intercellular hyphae were not found beyond the second layer of cortical cells. However, on the side of the root not showing radial elongation of cells, penetration occurred between the cells of the third layer.

The mycorrhiza of Pinus strobus showed intercellular hyphae throughout the cortex. Various combinations of stains have been used in order to determine the most desirable for showing details of structure in all types of mycorrhiza to be collected from the field.

Flask methods for growing plants under sterile conditions are being tested with several kinds of nutrient solutions. One series has been planted with chestnuts (Castanea japonica). Greenhouse sand cultures in open earthenware crocks are also being used in order to determine the possibility of growing plants free from mycorrhiza by more simplified methods of handling.

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APPALACHIAN FOREST EXPERIMENT STATION

General

Early in the month R. V. Reynolds visited the Station to discuss the status of the proposed economic and social survey of the Appalachian Mountain region, plans for which had been considered at a meeting at Knoxville attended by Reynolds as a Forest Service representative. Mr. Reynolds' visit also afforded an opportunity to have the work of the

Division of Forest Economics, and particularly the purpose and plans for extensive revision, explained to the staff. Another visitor was F. I. Righter. Mr. Righter, who has been teaching at Cornell during the past two years, was on his way to Placerville, Calif., to begin work with the Eddy Tree Breeding Station.

For the extensive revision work, the field assigned to the Station consists of West Virginia, Virginia, North and South Carolina. As a first step in this work Frothingham made a trip to Raleigh and Durham, N.C., for conferences with J. S. Holmes and F. H. Claridge of the North Carolina Forest Service, J. V. Hofman of the Forestry Department, North Carolina State College, and C. F. Korstian, Director of Duke Forest. Incidental visits were made to the Poole woods - a 75-acre tract of unusually fine loblolly and shortleaf pine near Raleigh --and to the State Prison Farm, where experimental cuttings according to a number of silvicultural systems have been made by forestry classes under Dr. Hofmann's direction.

Bent Creek Experimental Forest

The Asheville Community Woodyard has finished cutting on two units of the Bent Creek Forest. On one unit of 11.4 acres the cutting of poorly formed and defective trees and all trees of inferior species yielded 320 cords, an average of 28 cords per acre. The limit of utilization was small, all branch wood and small trees being taken to a diameter of 1½ inches. It is estimated that ten to fifteen cords per acre remain on this unit.

On the other unit of 9.7 acres no trees less than 14 inches d.b.h. were cut. There were 108 trees marked for cutting which scaled 20,000 board feet sound lumber. With the close utilization employed these trees yielded 215 cords of fuelwood, or an average of 22 cords per acre. The stand left after the cutting averaged between ten and fifteen cords per acre.

The grading of the three and three-fourth mile road through the forest is nearing completion. This job has furnished work for forty men since the middle of January. Many more men have applied for work than could be hired and in order to help as many as possible the foreman has adopted the scheme of changing half his crew every Monday morning. This road crosses the forest twice, with the result that a truck may be taken to within a third of a mile from any point in the forest. Protection of the experiments from fire is thereby greatly increased. Because the construction of the road at this time is due to the economic depression, the name "Hardtimes Road" has been suggested for it.

During the month preliminary plans were drawn up for the proposed new buildings at Bent Creek. These include four small laboratories, a greenhouse, a combined bunk and mess hall, and a garage, none of which are to exceed $2,500 in cost.

Forest Management in North Georgia

During February the first manuscript drafts of several phases of the general report on the North Georgia studies were finished. Barrett, with Daley's help, completed the computations on growth and also such compilations of statistical data as were considered necessary for the discussion of forest composition. Photographs of stands to which the growth data apply were also selected for inclusion in the report.

One outstanding point of interest in the growth study was the unusual increment made by the Sosebee Cove stand of yellow poplar, located in the Cherokee National Forest. McCarthy measured a plot in this stand in 1923. At that time the dominant trees were 48 years old and the trees 12 inches and greater d.b.h., contained 31,292 board feet per acre by the Scribner Decimal C rule. In 1930 the stand was again examined by Hursh. The trees 12 inches and greater d.b.h., were found at that time to contain 35,892 board feet per acre. An increase of 4,600 board feet, or an average annual growth of 657 board feet per acre for the seven years. This is an average annual periodic growth of 2.1 per cent.

During the analysis of the growth data it was found that at the higher elevations mortality in chestnut, due to the blight was considerably less than at the lower elevations. Computed mortality percentages are shown in Table 1.

Table 1. Decrease in mortality of chestnut with increase in elevation.

Elevation feet	Per cent of total basal area killed by blight	Basis Number of half acre strips
1900	100.0	1
2000-2300	77.5	9
2800	35.9	13
2900	22.7	3

Practically the same results were obtained when number of trees instead of basal area was used for the percentages. Perusal of available literature on this subject fails to disclose any information which would tend to show a correlation between elevation and mortality due to blight. In fact, other investigators who are better qualified to study the chestnut blight appear to be of the opinion that no such relationship exists.

A report on the establishment of six permanent sample plots at the Georgia Mountain Experiment Station was completed by Abell. He also furnished the first draft of a report analyzing the vegetation of the farm woodland included in the station.

Management of Loblolly Pine

The analysis of the data on increase in growth of loblolly pine trees left after cutting was carried on by MacKinney in Washington. It was found that the regular procedure followed in multiple curvilinear correlation (U.S.D.A. Tech. Bul. No. 210) would not serve for this problem, so a modified technique was employed wherein axes were shifted in the analysis of the correlation existing between three variables.

In the study the correlation was determined between increased diameter growth and the following factors: estimated crown volume, d.b.h., height at the time of the partial cutting, per cent of the basal area removed from a radius of 30 feet around the tree, and the total basal area in this 30 foot radius. It was found that crown volume, d.b.h., and per cent of basal area removed from a 30 foot radius about the tree were the most important factors affecting increase in diameter growth. Height of the tree at the time of cutting, and total basal area within a 30 foot radius from the tree were found to be of small importance.

Further analysis, in which the ratio of crown length to total height was substituted for crown volume, disclosed that the crown ratio is more closely correlated with increased growth than is crown volume. The poorer correlation between crown volume and increased growth was probably due to inaccuracies in the estimated reduction factors, used in determining crown volume. An accurate value for crown volume would doubtless show greater correlation than crown ratio since it would be a closer measure of the food producing capacity of the crown.

Fire Studies

A report has been received from the Bureau of Chemistry and Soils giving the chemical analysis of five horizons from each of the soil profiles from the unburned and burned plots of longleaf pine at Drainland, S. C.

The burned plot has been subjected to a controlled spring burning for thirteen years. The unburned plot is adjacent to it and was established as a check plot for the annually burned area. The soil samples were collected by Hursh during early summer of 1930. The most striking difference brought out by the comparison of soil profiles, is the loss on ignition in the A_1 horizon, the unburned profile showing a thirty per cent higher loss on ignition than the burned. The unburned A_1 horizon also showed a 100 per cent greater moisture content. The analysis moreover showed an appreciably higher percentage of CaO, K_2O, Fe_2O_3 and Al_2O_3 in the unburned horizons. The nitrogen content is considerably higher in the B_1 horizon of the unburned plot. Neither plot, however, showed the presence of either nitrates or CO_2 as carbonates. The A_1 horizon of the unburned plot showed a p H of 4.13 as compared with 4.66 for the burned plot. Although the difference was less in the other horizons, the burned plot

was slightly less acid throughout. Hursh is preparing a detailed report on the significance of the differences on the available nutrient in the soil, and the relation of these to tree growth.

Phenology

Buell, as a member of the Committee on Phenology, Appalachian Section Society of American Foresters, has been arranging for the cooperation between the Station and the Section. Circular letters were written to the ten members of the committee and to the State foresters and forest supervisors in the region in order to line up the cooperating observers. A standardized set of instructions for all observers is being prepared.

Pathology

Since his return from Washington early in the month, Nelson has been occupied with the revision of the manuscript on bluestain and on routine laboratory work in connection with the study of hardwood heart-rots.

Biology

Burleigh spent most of the early part of February in the office preparing field notes for submission to the Washington Office.

The exceptionally mild weather resulted in an early northward migration of birds which last year were not observed until March. Careful records of the migrating birds are being kept.

A comparative study is being made of biological conditions now existing on an experimental area at Bent Creek, trapped about a year ago and then burned over. Results so far indicate that rodents return very slowly to these mountainsides after a fire.

Continued observations reveal interesting facts concerning the distribution of birds and mammals on Mount Mitchell.

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CALIFORNIA FOREST-EXPERIMENT STATION

General

On February 11, Director Kotok returned from a month and a half detail at Washington with Regional Forester Show, primarily in connection

with manuscripts on fire research which they have in progress of publication, but with much exciting by-play of current legislative progress. After only a week (partly) in the office, he left with Kraebel and Lowdermilk for two important conferences in southern California. These were the State Rural Fire Institute, and the annual meeting of the Southern California Association of Foresters and Fire Wardens. Kotok also attended a meeting in San Francisco of the California Forestry Committee. Kotok and Brundage participated in a meeting of the so-called White Fir Committee of pine region lumbermen, with the Forest Service at which Brundage's special report of the Woods and Mill studies as relating to white fir was the piece de resistance in respect to the demands of the lumber operators for timber sale concessions from the Regional Service on this species.

There are three items of interest to the Station before the present State Legislature, which will materially affect our program of work for the next two years. The University of California has a $25,000 item for the biennium in its budget, for cooperative work with the Station. A bill has been introduced providing for $25,000 for the biennium to the Department of Public Works providing for cooperative work with the Station in watershed studies. This bill is introduced as a result of the recommendations of the Joint Federal-State Water Commission. The third item provides $100,000 for the next biennium for topographic mapping cooperation by the State with the Geological Survey. This latter measure is of much importance to us to expedite our cover type work in the northwestern part of the State, where topographic control is largely wanting.

The Station had the pleasure of calls from two unusually welcome visitors, namely Knowles Ryerson, Chief of the Office of Foreign Plant Introduction of the Department, in respect to Kraebel's search for fire resistant exotics for southern California planting, and H. N. Whitford, formerly of the U. S. Forest Service, later with the Philippine Forest Service and Bureau of Science and now Director of Rubber Supply Research for the Goodyear Rubber Company, and located at New York City, the Malay Straits Settlements, and all way points.

Two unusually interesting University activities for Station Staff members occurred during the month. The first was a series of soils seminars at which Prof. C. F. Shaw gave an account of his recent six-months trip through China, Mongolia, Siberia, Russia, and Europe in connection with attendance at the International Soils Congress at Leningrad and Moscow. In this account he gave large attention to forest and forest soil conditions. The second was one of the Forestry School seminars devoted to the place of animal life and game management in forestry in California, at which Professors Grinnell and Dixon of the University gave the chief papers. Both items tie so closely with pending developments in Forest Experiment Station interests that they were of tremendous value.

The end of the month called on the time of project leaders in the preparation of annual reports for the Regional Investigative Committee Meeting, which had to be postponed till early March on account of the protracted absence of Kotok and Show.

Management

Most of February was spent by all hands in compiling data for the various methods of cutting projects. Gibbs and Agri finished tabulating and checking most of the 1930 field data from the older plots. Hasel completed for typing the progress report for the Sierra plot, 1911-1930. Clements is analyzing the data for the four older Stanislaus plots. Most of Dunning's time has been taken up with computation and checking of stand and cutting data from the three Stanislaus Woods and Mill study plots for inclusion in a preliminary report issued February 20 for the white fir committee.

L. D. Lloyd was engaged February 20 to complete planimetering of several Mc plot maps and many Mr quadrat maps. The results are partly for use in a statistical analysis of the 1780 Mr quadrats now being made by Reineke.

Plans are being made for fencing a number of Mc and Mr. plots and the Station reserve at the Stanislaus Branch. An addition to the station will be built this spring and a water supply system installed.

Redwood Studies

The review of redwood literature was continued during February with the emphasis on unpublished Forest Service reports which were prepared in the "old days", 1904 to 1907, by H. G. Merrill, Wm. C. Hodge, Jr., Clinton G. Smith, and other forest assistants and assistant inspectors. The redwood bibliography has been brought up to date, and the most important articles are being reviewed. A number of men with a knowledge of the redwood region were also interviewed, including Prof. Emanuel Fritz and Professor Sampson of the University of California, Gibbs, recently forester for the Casper Lumber Co., and Arnold Weber of the Forest Service. Weber has loaned the Station original material used in preparing a map of the redwood region, showing the status of virgin and cutover redwood lands in 1926. The section on redwood studies for the Report for the Investigative Committee was prepared and some time was spent in summarizing precipitation data on the Barranca Burn area for Mr. Kraebel.

Forestation

In Berkeley Kraebel prepared a review of forestation in the Region for the Investigative Committee Meeting and had a brief preliminary conference with Ryerson concerning the introduction of foreign plants for southern California.

Winter has continued its hold upon Feather River Nursery and prevented any work with the soil during the month: A fertilizing experiment and the sowing of sugar pine seed are two projects which have thus been delayed by the weather, but Morrow has been fully occupied with needed repairs and improvements on the several buildings of the Station.

At Devil Canyon Weaver completed all planting experiments as planned and shipped most of the surplus bare-root stock to the various southern counties. Transplanting into nursery checks is nearly completed, leaving potting still to be done. The month was stormy and cloudy, with very little wind until Washington's birthday when a strong gust blew down one of the old Monterey cypress trees of the group which shelters the nursery dwelling. Rainfall for the season reached a total of 16.65 inches, of which 6.40 inches fell in February. Temperatures ranged between 39 and 66 degrees; relative humidity between 19 and 92 per cent.

Among a lot of 1-0 stock sent to Devil Canyon from surplus of the Forest School nursery at Berkeley, were two species not hitherto tried in the south: Japanese cedar or Sugi (Cryptomeria japonica) and Australian cypress pine (Callitris arenosa). Several hundred seedlings of maritime pine (Pinus pinaster) were sent to the County Forester at Santa Barbara for trial in the coastal dunes in that county.

During a brief trip south Kraebel examined the road-fill erosion control experiment; found that brush-barrier-seed and the road-oil treatments had proved most effective against erosion from the heavy rains of the month. Interesting was the fact that practically 100 per cent of the willow and elderberry cuttings used to peg down the contour brush barriers had sprouted, and some of the shoots had reached 6 inches in height. Alder, Rhamnus, Oak and Styrax cuttings showed no signs of sprouting. Vigorous lines of barley from 6 to 8 inches high formed the principal vegetative obstacles to erosion, and seedlings of wild sunflower in abundance gave promise of more substantial control later.

Cover Types

Wieslander spent the last half of February in an inspection trip of the work in San diego, Riverside, and Orange counties, where there are five 2-man crews in the field. Progress for the month was not so favorable as in January because of unusually heavy rains, about 9 inches in two weeks, and just prior to these storms, the work of one crew was interrupted by the State Ranger being called on to suppress a 400 acre chaparral fire. In spite of these delays the mapping is about 60% complete in these counties, and there is not much doubt that remaining area will be entirely mapped by April 15.

In the Santa Ana Mts. of Orange County, Wieslander noted a striking instance of vegetation change as a result of fire of several years ago. The dominant type for the locality is a mixture of chamise (Adenostoma fasciculatum) and Mountain Olive (Ceanothus crassifolius), averaging about 6 feet in height and very dense. Normally following fire there is a regeneration to the original type in the form of chamise sprouts and an abundance of Mountain Olive seedlings (never sprouts) with the chamise making very rapid height growth for several years. However, in this case the chamise is of very stunted growth, having the appearance of having been clipped and there isn't a single individual of Mountain Olive anywhere within the limits of the burn. A closer examination reveals that at least inches of soil have been removed as a result of heavy precipitation following the fire and with it of course the supply of Mountain Olive seed and the fertility necessary for rapid growth of chamise sprouts. Possibly the absence of the Mountain Olive may also contribute to the slow growth of the chamise since Ceanothus species like legumes are nitrogen fixing and probably are a considerable factor in promoting soil fertility.

The completed type map in this locality will show two distinct types, chamise mountain olive and pure chamise, the limits of the latter coinciding with the limits of a large burn.

Ecology

Some of the findings of the study of chaparral succession following fire were presented by Kraebel in his paper before the Fire Institute at the Westwood Campus of the University of California. The point selected for emphasis was the significance of herbaceous and graminaceous vegetation in developing, under favorable conditions, an effective control of run-off and erosion at the point of origin. The quick growth of small plants in incipient gullies, the development of "litter-mats" or small check dams through the anchorage of windblown dead stems by annual grasses, the protection of inter-shrub soil surfaces by herbaceous growth - all such small-scale vegetative processes in burned areas build up a collective effect which has an importance far greater than the size and nature of such plants would indicate. Their influence is magnified because it is exerted at the point where the raindrop hits the soil. By means of lantern slides of repeat photographs of selected spots in burned areas this process of vegetative control was made graphic. The paper was discussed by Prof. O. L. Sponsler, head of the botany department of the University of California at Los Angeles and by E. C. Eaton, Chief Engineer of the Los Angeles County Flood Control District. Mr. Eaton rather electrified the audience by unequivocally endorsing the importance of the vegetative cover of southern California watersheds in regulating run-off and preventing excessive erosion. He declared his belief that such cover is essential to any comprehensive program of flood control and water conservation in the south.

In the course of Dr. Whitford's visit it was brought out that several species of the genus Euphorbia, which we have in hand for trial as noninflammable, cover plants for southern California firebreaks, are potential rubber producing plants. Dr. Whitford, however, was not visibly disturbed on behalf of his company over the prospect of competition from the possible harvest of future firebreak crops of Euphorbia intisy.

Forest Influences and Erosion

During the month of February Sundling tabulated the data up to date for the five large water cycle tanks at Berkeley. The object of this phase of the experiment is, as may be recalled, to measure the relative influence of litter and grass cover on surficial run-off and erosion and on the water cycle. The cover condition of the five tanks is shown as follows:

Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Grass	Grass	Litter from Chaparral	Grass	Grass
Hordeum	Bromus	brush	Hordeum	Bromus

The grasses employed are Bromus hordeaceus and Hordeum, murinum in duplicate tanks.

An interesting by-product of this study is a measure of the relative yield of water as percolate through the three foot depths of soil. Likewise the evapo-transpiration loss from grass covered surfaces may be compared with that from the litter covered surfaces in the following table.

Items	Tank Numbers I	II	III	IV	V
Total rain, natural and artificial in cubic feet catch by each tank	21.48	21.02	23.70	23.75	21.06
Surficial Run-off in cubic feet	0.36	0.33	1.28	0.28	0.72
Seepage in cubic feet	8.62	8.12	13.18	8.77	8.77
Depth of seepage in feet	0.43	0.40	0.65	0.43	0.43
Total Evapo-transpiration loss					
in cubic feet	12.50	12.47	9.24	14.70	11.57
in per cent of rain	59.80	62.96	44.40	63.09	58.37

Thus it appears that the difference between the yield of ground water between the grass and litter covered surfaces approximates 0.2 of a foot in depth out of a total depth of rain of 1.18 feet in favor of the litter covered surface. No growth is permitted in the litter covered tank.

The visit by Cooperrider of the Southwestern Forest and Range Experiment Station was a pleasant and profitable event. Opportunities were afforded to discuss the details and principles involved in experimentation into the influences of vegetation, both forest and forage, on the control of water yield and erosion from watersheds. It becomes more and more apparent that the management of watersheds primarily for water production is the direction which public land management must take in western America.

National Water Users Conference

Lowdermilk presented a paper before the National Water Users Conference on February 10, entitled "Managing Watersheds of the West Primarily for Water Production."

The resolutions Committee presented and the Conference adopted two resolutions which are considered of importance within the field of forest influences. They are as follows:

Resolution No. 7

Relationship of Watersheds to Irrigation

We recommend that watersheds which yield supplies of water for irrigation and allied uses be generally recognized as an integral part of projects concerned, and further that such watersheds be managed primarily for sustained maximum yield of beneficial water.

Resolution No. 9

Scientific Investigations of Watersheds

We recommend that scientific investigation of problems involved in the administration of watersheds in the United States be adequately supported in order that various factors involved may be determined and evaluated as a factorial basis for development.

R. W. Blackburn L. C. Freudenthal
Thos. R. King I. D. Yeager
E. Bergeson

During the latter half of the month Lowdermilk conferred with representatives of the Farm Bureau of Ventura County to investigate the relation of brush cover to water supply. The work of this committee arose from the action taken by the Grand Jury of Ventura County in December, in which it was recommended that further measures to protect the brush forests be given up, and that "light burning" of these brush fields be carried out as a means of increasing water supply. The action of the Grand Jury was taken as a result of discussion in certain quarters following a big fire in Ventura County last October. Since the action of the Grand Jury a heavy fall of rain had set up conspicuous and damaging erosion accelerated far above the norm under brush cover control.

The Farm Bureau Committee was particularly interested in the damages resulting from deep gullies up to 25 feet through fields on the lower slopes of the burned over mountains. The Committee was taken over the installations at Devil Canyon, and the role of vegetation in the yield of water from water sheds was discussed in detail. It is found that the evaporation loss of rainfall may exceed and usually does exceed the transpiration loss. The Rain Retention Pans have shown interesting and new data in this respect. Thus bare soil proves to intercept and return moisture to the air to a greater degree than the interception of chaparral foliage and litter.

Fire

Two important conferences were held in southern California during the month at which Kotok delivered two papers, one on "Fire, a community problem", and another on "Research as an aid in fire control". Kraebel delivered a paper on "The fire problem and erosion prevention in southern California watersheds." The first meeting was under the auspices of the Extension Division of the University of California, which has been fostering an organization called the "Rural Fire Institute". This second meeting of the Institute was attended by many agencies interested in forest and rural fire protection. The meeting was held at the University of California at Los Angeles and lasted for two days. There was the finest display of fire equipment ever exhibited in the State. The developments that have been made in water tanks and pumping outfits were particularly striking. The other meeting was held under the auspices of the fire wardens and foresters of southern California and continued for two days. Excellent papers dealing with the fire problem in southern California were delivered.

Visibility Study

The visibility study of a portion of the Shasta Experimental Fire Forest was continued during the month. Efforts were also directed along the lines of standardizing methods of making such a study. Additional

profile visibility maps were drawn to cover areas of risk or hazard which are unseen by other lookouts. Up to the present time visibility maps have been prepared for 26 points.

These points were each rated according to fire business within their zones of visibility. Interesting facts were brought out in this connection. For example, one lookout which has for several years, been considered as of very doubtful value by the administrative force, showed that within its zone of visibility a larger number of fires had occurred than had occurred in the zone of visibility of a more favored lookout point. For this purpose a large scale business map was prepared which gives the location and class by symbol, for the past ten year period.

Inquiry has been made into the field of portable towers. A light, easily transported tower will be of great advantage in developing methods of determining the most practical height of lookout towers on individual points. At the present time the most promising appears to be a temporary tower developed by the French and which has had some use in Canada by the Geodetic Survey for observation and mapping. This tower consists of 12 foot ladder sections properly seated and guyed. The height to which such a tower has been built up is 130 feet.

Efficiency of Detection

The statistical study started in January dealing with detection by lookouts was completed for the two representative forests selected. Graphic analysis was made of the statistics covering the past three years.

The following represent some of the items brought out in this analysis:

1. The highest effectiveness rating for man-caused fire discovery of any of the 59 lookouts considered was 12%, while the second highest was 8%. This means the first lookout had the possibility of discovering 24% of all man-caused fires and actually made first discoveries on only 50% of his possibilities.

2. The per cent of total fires occurring, discovered by all agencies within 15 minutes, was for man caused 30%
lightning 25% M.C. + L.C. = 28%

3. The per cent of total fires occurring, discovered first by lookouts within 15 minutes was for man-caused 18%
lightning 19% M.C. + L.C. = 18%

4. The per cent of total fires occurring, discovered first by lookouts as A fires was for man-caused 14%
lightning 59% M.C. + L.C. = 21%

as B fires man-caused 16%
lightning 21% M.C. + L.C. 17%

These figures and others derived from the study show that the effectiveness of lookouts must be currently checked and weighed to get the service available from the lookouts which we now maintain. In addition, it is shown that further study and improvement of the detection branch of our fire control organization is necessary in order to attain our fire control objectives.

The preparation of the Investigative Program for 1931 and the report on progress up to March 1 on Fire Studies was completed for use at the Regional Investigative Committee meeting to be held on March 2, 3 and 4.

Products

Woods and Mill Project

A preliminary report of the Stanislaus study (Pickering Lumber Company operation) was sent to members of the so-called "White Fir Committee" on February 21. Readers of the Monthly Report will recall that an emergency request was made from the Regional Forester for as much detailed information regarding lumbering costs and margins as could be made available before the last of February, to meet the timber sale operators' claim that modification of Forest Service present white fir cutting and utilization requirements was absolutely essential if the purchasers were to remain solvent. The Stanislaus study was the only source of detailed data, but under customary computing procedure final results would not be ready for many months to come. The only alternative was to turn out some "semi-final" results through the use of high-speed short cuts, without taking time for smoothing the rough places by statistical formulae. Nevertheless, the log diameter and tree D.B.H. cost-value-margin tables, based on more than two hundred occularly adjusted curves are pretty consistent as between different species and classes of material and it is believed that the tentative general conclusions will not be greatly altered when more refined methods are used.

The six copies of the report were sent out with a call-back attached, as no publicity should be given to the figures until the whole study has been recomputed on a grade-curve basis. For the information of co-workers in other Regions, a few of the results are appended hereto. Please bear in mind that they are not ready for broadcasting.

Based on 1929 values and costs, the economic D.B.H. limit in western yellow and sugar pine was about 20 inches. In white fir, no trees paid the direct cost of manufacture, and none below 35 to 40 inches D.B.H. contributed anything towards decreasing fixed costs per acre (spur construction, landings, camps). The economic log diameter limit in white fir was about 20 inches; that is, the operator loses money on every step of the operation beyond the fixed costs per acre, felling and limbing, when he takes in a log smaller than 20 inches in diameter in fir tops. Above that diameter something was contributed to fixed costs, but these were not completely absorbed short of 31 inches diameter.

Sugar pine, the most valuable species, gave a margin for stumpage and profit of over $20 per M feet; western yellow pine, about $15 per M. White fir cut according to Forest Service methods showed an average loss of over $2.00 per M, not including stumpage. The loss on incense cedar was about 70¢ per M. In 1930, because of the reduced demand and the marked decline in selling prices, the loss on white fir was over $6.00 per M ft. Decrease in profits on pines was in proportion.

The average cost of logging, transportation and milling from the study was around $21.00 per M feet mill tally. The particular stand studied yielded approximately 47 M feet per acre of 5 common and better lumber on the Forest Service marking basis. Since the recommendations of the Regional Forester pertaining to modification of white fir requirements have yet to be approved by the Forester, further comment will be withheld at this time.

Heptane

Hill was unable to make more than slow progress during the month on the proposed heptane bulletin. He participated in a conference between the Regional Office of Forest Management and the California Chemical Corporation respecting the terms of renewal of a heptane cuppage sale contract. The recommendations of Hill's office report were the basis of modification.

Termites

Hill participated in a meeting of a small group of four for the purpose of laying down recommended principles and procedure for the preparation of final report of the Termite Investigations Committee, whose work has now reached that stage. This report seems likely to be considerably more voluminous than that of the Marine Piling Committee, its probable length being now estimated at 750 pages.

Consulting Entomologist

Dr. Salman has completed his notes on insect specimens collected last summer, and is formulating his plans for an early beginning of the field season; if his present arrangements are carried out, this will be initiated by a trip to the southern part of the state around the first of March, in company with Assistant Entomologist L. G. Baumhofer.

High-tempature tests to determine fatal temperatures for Scolytus ventralis larvae were run by G. R. Struble during the month of February, as a preliminary step to a test of the control of this insect by solar heat.

On February 11, 12 and 13, J. A. Beal and G. R. Struble made a trip to Strawberry, Stanislaus National Forest, where they obtained broad bark and green logs for continued biological studies of the western pine beetle and fir engraver beetle.

A cabinet for maintaining four stages of constant temperature conditions has been built into the laboratory, and will be used by J. A. Beal in his studies for the determination of optimum temperature conditions for the western pine beetle.

Mr. R. N. Jeffrey, who has been under appointment by the California State Board of Forestry and assigned to cooperative work with the Berkeley Station, is now carrying on the sugar determinations from samples of infested western yellow pine which were collected in the field last summer. This study is being conducted as a basis for determining the nutritional requirements of the western pine beetle. Mr. Jeffrey's work will involve the analysis of 70 samples collected in infested areas on the Modoc National Forest during the past summer.

Mr. R. E. Campbell, of the Soil Insects Division of Truck Crop Insects at Alhambra, Calif., visited the Berkeley Station on February 6.

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CENTRAL STATES FOREST EXPERIMENT STATION

General

Early in the month the Ohio State Forestry Association met at the University in connection with the annual Farmers' Week. The session was well attended. Alan F. Beck of Columbus was elected president. Mr. Beck has acquired 600 acres of land in the hilly section southeast of the city and is actively planting the old fields. He intends to continue acquisition of land for this purpose as opportunity is offered. Day presented a paper on the relation of grazing to farm woodland management at this meeting.

The Station has been assigned a part in the extensive revision of data on acreage, stand growth and drain of forests in the United States. The four states, Ohio, Indiana, Illinois and Iowa are assigned to this Station. E. M. Bruner, in charge of this work in Kentucky, Tennessee and Missouri, and J. H. Gibbons came to Columbus on February 18, to coordinate this work with the National plan. Mr. Gibbons in charge of the Office of Forest Products at Portland, Oregon has been detailed to Washington to head up this revision.

The date of the next meeting of the Central States Forest Research Council was set for May 26 in St. Louis to precede the National Conference

on State Parks fixed for May 27 and 28. The Council membership selected the date.

McCarthy covered four lecture periods in the regular course given to Forestry students at the University. Students enrolled here in the regular Forestry course now number twenty-nine. This is evidence of the success of the plan initiated three years ago to give the first two years of a regular Forestry course. Other agricultural colleges might well adopt this plan to give two years instruction to men seeking Forestry training in their own State.

Plantation Study (Fp-1)

Kellogg left February 15 for Washington to secure assistance in the Section of Computing in preparation of his yield table for planted black walnut. He expects by this assistance to be free by June 15 to undertake a new study of yield of planted black locust.

R. C. Hall, an entomologist who plans to undertake a study of the locust borer in this region, came to Columbus on February 14 to correlate the plan for his work with that of the Station. A party working on yield of plantations will have an entomological observer, who will secure records of borer infestation. The reconnaissance party making a broad study of the region for borer infestation will locate plantations suitable for measurement of yield. This will result in a saving of time in both lines of investigation. The study of nitrogen fixation by black locust will also form a part of this study.

Woodland Grazing Study (Pa-1)

Considerable progress was made during the month on the compilation and analysis of the plot data secured in the study of the classified woodlands of Indiana. This study is a cooperative project between the Purdue Agricultural Experiment Station, the State Forester of Indiana and this Station. The manuscript covering this study is partly prepared and Day expects to have the first draft of his portion of the bulletin completed by the middle of March. The annual report covering the work on the grazing project for 1930 and the program of proposed work for 1931 was prepared during the early part of the month. In this report it was recommended that the grazing project be subdivided into the several distinct phases along which the work is developing. In this and future monthly reports, progress will be reported under these specific phases. The status of these phases is briefly reviewed.

1. Reconnaissance Phase

This phase covers the extensive regional survey which was made by Meyer in 1928 and continued by Day in 1929. One hundred and twenty-eight plots in about this number of farm woodlands widely distributed

in the region, have been secured and the analysis of about one half of these plots have been completed. This analysis will be completed prior to the coming field season, and on completion the manuscript will be published either as a farmer's bulletin or miscellaneous circular under the title of "Grazing as a Factor in the Present Condition of Farm Woods of the Central States."

2. Reconstruction Phase

This phase covers the study of the recovery of farm woods following the exclusion of livestock. This study is being made in cooperation with the Purdue Agricultural Experiment Station and the State Forester of Indiana. Data from 54 additional plots secured last year are being analyzed and a manuscript covering this study is being prepared jointly by Day and Mr. DenUyl of the Purdue Agricultural Experiment Station. A number of the areas visited last year will be established as permanent sample plots to be followed through a period of years. This will constitute a more intensive study of this phase which will be covered in a future publication.

3. Livestock Management Phase

This phase was set up for the purpose of determining possible methods of livestock management in the farm woods compatable with the production of timber. The first study which will be developed under this phase has been previously reported as the Finney-Purdue project. This study will be initiated in the spring of this year.

4. Growth and Yield Phase

Purposes of this phase is to determine the effect of grazing on the growth and yield of the farm woods. Effects of grazing upon the reproduction have been covered under the reconnaissance phase and it is the purpose of the proposed study to compare the growth of grazed and ungrazed areas by periodic remeasurement of permanent sample plots, especially on paired areas. A number of such areas have been selected and will be established during the coming field season.

5. Economic Phase

This phase has been set up to provide for intensive study of the economic phases of the grazing problem, particularly to secure adequate data for the purpose of appraising the relative returns to be expected from grazing and timber production in the farm woods. Active work will not be undertaken on this phase at the present time, but will be delayed pending active work on the forest survey project for this Region.

Litter Study (M-1)

Auten in his study of litter has secured results which indicate that approximately 50 per cent of the calcium content of the litter is locked up in combination, probably with organic acids. He finds that even in the presence of such calcium in combination, soils may be acid in reaction. This is not only evidence that forest cover has a tendency to accumulate calcium from deeper soils into the surface horizons but may also have a bearing on the survival of germinated seedlings.

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INTERMOUNTAIN FOREST EXPERIMENT STATION

Regional Investigative Committee

The Intermountain Regional Investigative Committee meeting was held in the Regional Forester's office on January 30 and 31. In addition to the regular members of the Regional office and the Intermountain station the meeting was attended by Forest Supervisors G. B. Mains, Alex. McQueen, and A. C. Folster; George Collard, president of the Utah Woolgrowers Association and J. M. Macfarlane, president of the Utah Cattle and Horse Growers Association; W. A. Denecke of the U. S. Sheep Experiment Station, Thos. V. Murray, Rodent Control Leader, U. S. Biological Survey, Idaho; P. V. Cardon, Director, Utah Agricultural Experiment Station; William Peterson, Director of Extension, Utah Agricultural College; Dr. Geo. R. Hill, American Smelting & Refining Company; and Profs. T. G. Taylor, R. J. Becraft, Reed Bailey and G. D. Clyde, of the Utah Agricultural College.

It seems that each annual investigative committee meeting is a little better than the previous one. Each person in attendance was keenly interested in the subjects brought before the meeting and furnished a lot of lively discussion.

Unemployment Funds

An allotment has been received from the First Deficiency appropriation act for use in unemployment relief. These funds have been suballotted to different projects over the region and will be used largely for the construction of fences to enclose experimental range areas. Although the total allotment is not large the expenditures will be of direct benefit since some of the funds can be used immediately for the cutting and hauling of fence posts in the various localities where the enclosures are to be constructed.

Influences

Reports indicate a uniformly light cover of snow on the watersheds throughout the region. Records obtained the last of February show that the water content does not exceed 40 to 50 per cent of average accumulation at this time of the year. An exceptionally wet March and April will be necessary to avoid extreme shortage of water during 1931.

Flood Control in Utah

The report of the Special Flood Commission appointed by Governor Dern of Utah, was printed. A bill has been introduced in the State legislature to charge the State Land Board with the responsibility for action in flood prevention and control. It provides for the acquirement by the State through purchase, exchange or lease, of important watershed lands in need of protection now in private ownership and for the better regulation of grazing on State-owned lands. Various members of the Commission, of which Director Forsling was a member, were called to appear before the Senate hearings on this bill.

Range Research

Spring-Fall Range

During the winter months Craddock has been engaged compiling the 1930 field data secured at the U. S. Sheep Experiment Station and adding these data to the records covering the period 1924 to 1929, that they might be analyzed for a report on the spring-fall project. This work is nearing completion. The basic data is already in such shape that active preparation of the manuscript is in progress.

Some new figures have been obtained showing the influence of different intensities of grazing on the carrying capacity and composition of selected paddocks. A few of the higher-lights are given below.

Grazing in the fall only maintained the carrying capacity and resultant changes in plant composition improved the palatability of the vegetation.

Moderate to light grazing in the spring for only 10 days, with complete use in the fall, maintained a consistently high carrying capacity and the composition of the vegetation remained practically unchanged.

Grazing continuously through the spring period, after vegetative readiness, and again in the fall, appeared to be practical for the first four years. However, the cumulative effect of intensive spring grazing plus adverse climatic conditions caused the productivity of this pasture to decline rapidly during three subsequent years to a point 60 per cent below the original carrying capacity.

In two other paddocks grazing continuously in the spring from the start of growth, whether for a three weeks period only or for the entire spring season, for seven years, profoundly influenced the carrying capacity as well as the composition of the vegetation. In the seventh year, the paddock subjected to three weeks of early continuous grazing had declined 62 per cent while the pasture which was grazed during the entire spring period produced only 25 per cent of its original carrying capacity. The decline in carrying capacity in each case was accompanied by a corresponding decrease in the density of the grasses and more palatable weeds, whereas the density change of the sagebrush was in the opposite direction, increasing in amount almost equal to the decrease in the palatable forage.

W. A. Denecke Leaving the U.S.S.E.S.

Word has just been received that W. A. Denecke, who has been Superintendent of the U. S. Sheep Experiment Station for the last several years and who has taken an active interest in the cooperative range studies being conducted there by the Forest Service, is resigning from the Bureau of Animal Industry to go into private business. He will be associated with a large sheep outfit near Bozeman, Montana, where he will serve as general manager. The Intermountain Station will keenly feel the loss of "Bill" but we all wish him the best of luck.

Denecke will step into his new job on April 1. So far his successor has not been announced.

Seasonal Development of Range Forage Plants

The important part which climate plays in the seasonal development of range plants is shown by six years of field records obtained at the Great Basin Branch Station on the Wasatch Plateau in central Utah.

Representative forage plants including grasses, perennial weeds and shrubs were selected on eighteen plots, distributed on different exposures in the oak brush type, elevation 6800 to 8000 feet; aspen-fir type, elevation 8100 to 9100 feet, and the spruce-fir type, elevation 9200 to 10,300 feet, to study the seasonal development of plants.

Growth measurements and phenological observations were obtained for seven grasses, seventeen perennial weeds and eight shrubs at five-day intervals throughout the growing season of each year. It was possible to obtain records on several species that ranged from the lower oak-brush type to the higher spruce-fir type. The seasonal development for one of these species, Letterman's needlegrass (Stipa lettermani), for an early year and a late year is compared with the six-year average in the following table. The other species correspond more or less to this record.

Stage of seasonal development	6-year average		Early year		Late year	
	Date	No. Days	Date	No. Days	Date	No. Days
Oak brush type						
Start of growth	4/22		4/16		5/4	
Vegetational readiness	5/22	30	5/17	31	5/24	20
Seed stalks fully out	7/1	70	6/24	69	7/7	64
Seed maturity	8/6	106	7/29	104	8/17	105
Aspen-fir type						
Start of Growth	5/22		5/19		6/3	
Vegetational readiness	6/19	28	6/12	24	7/2	29
Seed stalks fully out	7/19	58	7/17	59	7/21	58
Seed maturity	8/28	98	8/11	84	8/28	99
Spruce-fir type						
Start of growth	5/29		5/22		6/14	
Vegetational readiness	7/8	40	6/30	39	7/26	42
Seed stalks fully out	7/22	54	7/16	55	7/29	45
Seed maturity	9/2	96	8/31	101	9/10	88

Often the remark is made that an early spring means early feed. To a certain degree this is true but there is an uncertainty attached to it, just as forecasting fair weather for a certain period. In some instances in the oak-brush type plant growth started extremely early in the spring but later was retarded because of cold stormy weather, which resulted in a delay of vegetational readiness for that year. A late start in growth in the spring followed by persistent favorable climatic conditions resulted in the range being ready for grazing only slightly later than the six-year average date.

The development of the vegetation after approximately six weeks subsequent to the beginning of growth is pretty much dependent upon precipitation, and a deficiency of rainfall causes grasses to hasten development of seed stalks and seed maturity. In a year of above average precipitation, production of seed stalks and seed maturity is delayed materially. It is of interest to note that it requires practically the same number of days from the start of plant growth to seed maturity in either a late or early year.

Vegetational readiness of Letterman's needlegrass was four weeks later in the aspen-fir type than in the oak-brush type or for each 1000 feet increase in elevation vegetational readiness was retarded approximately eighteen days. The delay was approximately the same for the spruce-fir type which is 1000 feet higher than the aspen-fir type.

The growth of Letterman's needle grass in the spruce-fir type is relatively slow in the earlier part of the growing season, but there is rapid maturity of both forage and seed after the seed stalks are fully developed. The period of plant growth from the start of growth in the spring to seed maturity is gradually shortened as the elevation increases.

Biological Investigations

Much of January and part of February was spent by Associate Biologist Locke in the preparation of reports, particularly in connection with the investigation of the poison campaign carried out by the Biological Survey. In late January Locke attended the meeting of the American National Livestock Association at Seattle where he gave a paper on Game Management. He gave a talk also at the annual meeting of the Twin Falls Sportsmen's Association at Twin Falls, Idaho. Several conferences have been held with members of the Regional office regarding cooperative game studies. Plans and estimates for rodent-proof fences for study plots have been prepared and bids sent out for materials.

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NORTHERN ROCKY MOUNTAIN EXPERIMENT STATION

February has so far been the busiest month of an ususually busy winter for the Northern Rocky Mountain Station. With an extra job of large proportions already underway, involving twelve men compiling 10-year fire records, and with the attempt to catch up on compilation and report writing of silvicultural projects, there has fallen upon us the additional work of the extensive growth and drain revision and the emergency construction activity. Although the staff has the feeling expressed by the phrase "swamped with work" progress is being made on most of the activities. Naturally, some lines of work must be postponed.

In the field of fire research continued coding of fire reports was the main job during February. A dozen detailed men, mostly Assistant Supervisors, were engaged in the work. To date the coding has been completed for six forests having a total of 6,194 reports. Two additional forests will be completed within the week and by the end of March 12,000 reports will be coded for 13 forests. Work on the data for the eastern Montana forests is to be postponed until next winter as there is urgent need for early analysis of the records for the so-called fire forests which are located in the western part of Region 1.

Taking advantage of the assembly of Assistant Supervisors detailed to the coding, a conference was held to discuss the fire research projects that have been under way for several years. There was striking unanimity

of opinion among the men present that the weather forecasts are becoming more and more accurate and are being used in the field as a basis for fire control action. An outstanding case on the Clearwater Forest last summer consisted of a redistribution of men in accordance with a lightning storm prediction. The storm occurred and set 43 fires, all of which were reached and held to less than Class C size.

It was also agreed that better lightning storm data can be secured if the storm reports are called for from a selected and limited list of lookout stations. These selections are now being made and the total number of stations used in this study will be reduced to about one third the number used in 1930. This reduction in stations should result in less work by the field men in coaching and checking the observers, better reports from the observers at the selected stations, and less reports to code and analyze each year.

The research results in measuring fire danger were given exceptional attention in this conference because of Major Kelley's recent action in pointing out the lack of uniformity among the various forests in determining the need of emergency men and money. This has emphasized the need of some instrumental or standard method of rating the degree of fire danger prevailing or probable. After a description of the use of duff hygrometers and wood cylinders for this purpose three forests placed orders for such equipment. When these forests are equipped there will be a total of nine forests in this region using either duff hygrometers, wood cylinders, or both. Fortunately, additional help will be available next winter to care for the recalibration of these instruments, and to summarize the records obtained so that they may serve as a post-season rating of one station against another and one season compared to another. The need of this latter comparison was shown last fall when the Regional Forester desired measurements illustrating the degree of fire danger during 1930 as compared to 1927 (easy) and 1929 (critical).

On February 16 our fire research was given some publicity when Asst. Regional Forester Hutchinson of Region 5 delivered over the Pacific Coast network of the National Broadcasting Company a four-minute talk on "How Research Helps Solve the Forest Fire Problem" which had been prepared by Gisborne. Although this was broadcast at 1:45 p.m., Mountain time, it was received quite clearly in Missoula from both Spokane and Portland stations. Mr. Hutchinson, introduced as Ranger Bill, has a very good radio voice and delivered the material in fine style.

In the silvicultural studies the activity of the month was devoted to report writing and compilation of field data. Phenological compilations for our thirty odd observation stations received part of this attention, but most of it went to computing and tabulating of field records taken on our cut-over areas project of several years ago. Two office assistants were assigned to this attempt to catch up on back work. Temporary Assistant Fisher has been steadily engaged in compiling the reproduction records and has practically brought these to the stage where they are in shape for analysis. Ranger Renshaw, who is on detail

for a few weeks from the St. Joe Forest, has been giving his attention mainly to compiling increment records of residual trees on these old cuttings.

An interesting example of what has taken place on one of the old cuttings is afforded by a private area logged in 1904 on the Palouse Division of the St. Joe Forest. This area was cut selectively, in the poorest sense of the word, the logger simply removing all timber of value at that time and leaving the remainder. The slash was left in place and, escaping fire through some miracle, has now largely disappeared, only 15 to 20 per cent of the area still containing vestiges of debris in an advanced stage of decay. The logging left a stand of about 55 trees per acre, including 15 small white pines 8 to 11 inches and 23 white firs 5 to 25 inches in diameter at breast height. This residual stand averaged about 5,324 board feet to the acre, gross volume, in trees 8 inches D.B.H. and up, Scribner rule. In twenty years following logging this residual stand increased some 3,258 board feet giving a gross total of 8,582 board feet per acre, of which about 86% (7,359 board feet) is in merchantable timber. During this 20-year period following logging, the average white pine grew from 8.4 to 11.5 inches in diameter and the average white fir from 14.0 to 17.5", an increase of a little more than 1.5 inches per decade in each case.

Reproduction conditions are not so satisfactory on this area. The total amount of reproduction of all species, 4,617 seedlings per acre, is entirely adequate, stocking over 90 per cent of the mil-acre quadrats. But this total includes only 167 white pine seedlings per acre and there seems little doubt that less than 10 per cent of the new stand will be western white pine. As light conditions are reasonably satisfactory, the seedlings getting about 70 per cent of full sunlight, the lack of white pine reproduction is attributed directly to lack of seed, the white pine left at time of logging being about all under 11 inches D.B.H. and hence extremely poor seed bearers. Some 500 seedlings per acre, mostly white fir, are over 4.5 feet in height, but the great majority of seedlings are between 1 and 4 feet high. Most of these surviving seedlings originated at various intervals over the entire history of the cutting. Seeding-in is still taking place 24 years after cutting. The oldest white pine saplings are 16 years of age. There are no surviving white pine seedlings that can be attributed to stored seed or seeding coincident with the cutting.

Thompson gave a good deal of his time in February to the perfecting of plans and the preparation of lists of materials, bids and orders for emergency construction work at the Priest River Branch. This necessitated a trip to Missoula of several days to give Weidman an opportunity to go over the final plans with him in person. The construction work will involve chiefly replacing the present water system, building firebreaks, fences, garage and gas house, and doing major repairs to six or seven existing buildings and the sewerage disposal

facilities of the plant. Activity will begin early in March and will give three months employment to about 15 family men in the Priest River Valley, where the present lack of work in logging camps and elsewhere, upon which the small ranchers and homesteaders of the locality depend, has produced an acute situation for these people.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

General

The sixth annual meeting of the Advisory Council was held February 27. It was very well attended by Council members and the activities in forest research of the region were well covered and discussed. The Biological Survey was represented for the first time. Officers elected for the ensuing year were Aubrey R. Watzek of the Crossett Western Lumber Company, Chairman, Dean Hugo Winkenwerder of the University of Washington, Vice-chairman, and Thornton T. Munger, Secretary.

Munger made two trips to Salem, Oregon in the interest of the bill looking toward state financial cooperation on the forest survey; a bill in the amount of $5000 has now passed both Houses of the Legislature.

Six members of the Station attended the annual dinner and frolic of the Oregon State College Forest Club where over two hundred foresters and embryo foresters congregated. The following day Munger and Andrews held a conference with Director Jardine of the Oregon Agricultural Experiment Station and several of his assistants on the cooperation which the Agricultural Station is to give in predicting the acreage of forest land to be taken for agricultural use in the next thirty years.

Fire Studies

A large part of McArdle's time during the month was required for matters connected with the meetings of the Advisory Council, Regional Investigative Committee, and the Minor Studies Committee. McArdle again revised the working plan for the hour control study, and this project took a good deal of supervision, the Chelan, Fremont, Ochoco, and Malheur Forests being completed, and the study of the fire data for the Colville and Wenatchee Forests was started. Several conferences were had with the Regional Forester's organization concerning the proposed expansion of fire research activities. McArdle also met with Mr. Dague, fire weather spcialist of the Weather Bureau, to discuss weather forecasts and ways and means for obtaining more extensive cooperation between his organization and ours.

Most of Simson's time during the month was given over to analyses of the last five years' weather and fuel moisture content data, preparatory to writing a report on the subject.

While in Corvallis recently, Simson discussed various phases of the lightning and static studies with Professors McMillan and Starr of the School of Electricity, O. S. C. and with Professor Jordan of the radio department, and received a number of worth-while suggestions.

Simson and McArdle had an interesting conference with duPont representatives Krafsic and McAdams in which the possibilities of explosives in fire fighting were discussed. McAdams suggested that firelines might be built by means of small charges placed in the earth at short intervals and detonated by means of fuse and caps. Simson countered with the proposal that something in the nature of large diameter cordeau in a light-weight wrapping might be worth investigating, and Krafsic suggested cellophane as a wrapper. There appears to be some likelihood that this year duPont will assign some member of their organization to research along the lines discussed.

Reproduction Studies in the Douglas Fir Region

During the early part of the month, Isaac completed the first progress report on "Direct Seeding in the Fog Belt". This study which was started in the winter of 1928-1929 and includes the testing of Sitka spruce, western hemlock, and western red cedar, has shown promising results for these fine seeded species.

On February 12 Isaac accompanied Professor Starker of O. S. C. on a trip over the Peavy Arboretum. The various silvicultural studies being conducted by the students and the larger projects under way were reviewed in detail. One of the most interesting projects is a study of selective logging in young growth Douglas fir. Reproduction and accelerated growth as well as the economic phases will be studied on this area.

During the latter part of the month, a good start was made on the preparation of the first progress report on the measurement of physical factors in Douglas fir germination and survival that has been under way since 1927.

Mensuration

Meyer with two assistants worked on the compilation of the western yellow pine growth and yield data.

Compilation of the 20 years' record of some Douglas fir permanent sample plots shows interesting results. In 1910 three one-acre plots

were established in a 54-year-old stand of Douglas fir on the Cascade National Forest. At that time the average stand per acre, Scribner board feet, was somewhat over 33,000 feet. The 1930 measurements show that the average volume has increased to over 59,000 board feet or an average annual increment of about 1,300 board feet. Were the International rule used instead of the Scribner rule, the change would have been from 55,500 to 89,400 board feet, or an average annual growth of 1,945 board feet. The average height has increased from 104 to 136 feet, that of the dominants and codominants from 120 to 144 feet. The average diameter has grown from 13.7 inches to 17.8 inches. A striking feature of the last five-year period is the very slight loss through mortality, either by accidental cause or by self-thinning. Natural reduction in number of trees, which at the time of establishment of the plots was rather rapid, has now neared its base line. These actual experiences with the growth of second growth fir as found on permanently maintained sample plots should prove of great value in preventing the premature cutting of young Douglas fir timber such as is taking place in many places.

A compilation of 13 volume tables and 5 alinement charts for western yellow pine has been sent out to a list of about 75 interested parties. These are range-wide standard tables for Sites II to VI expressed in various ways.

Phenology

The unseasonable mild weather of the past few weeks was found to have considerable effect on plant growth. The first phenological observations for 1931 begun during the month show that some events are fully two or more weeks advanced over last year. A value of these calendar records of growth is in learning the range of variation from the average. Recently good use was made of the phenological records in the comparison of data on moisture in forest fuels for different years.

Forest Survey

Pratt, Briegleb, and Fire Warden Hargar have been making progress on the linear strip survey of Lewis County, Washington. A total of 54 miles of line has been completed in 25 working days, making a daily average of 2.16 miles. The area covered to date has been largely farm or cut-over lands, close to field headquarters, and conveniently located with respect to roads. It is not expected that the present rate of speed will be maintained as the more inaccessible and heavily timbered areas are reached. Andrews made the preliminary arrangements with Dean Johnson and staff of the Washington State College, Pullman, for a study in Washington of land use similar to that already arranged with Oregon

Agricultural Experiment Station. Andrews gave a talk at a meeting of the Society of American Foresters in Moscow, Idaho, on the forest survey, in connection with his trip to Pullman to see Dean Johnson.

Field work has been completed in Cowlitz County, Washington and Linn County, Oregon.

Mr. Matthews was on the sick list the entire month, a mastoid operation being necessary following an attack of grippe.

Forest Insurance

The outstanding accomplishment furthering progress on the insurance study during February was the completion of a definite plan for the collection of data bearing on the evaluation of elements of specific hazard. This involves the questionnairing of the district wardens through the medium of a supplementary individual fire report for each fire of over 50 acres during the five-year period just past. The design of the report form was the result of a considerable amount of careful work since it necessitated achieving the rather delicate balance between furnishing needed data and imposing only a reasonable effort on the voluntary cooperators.

At the end of the month this work was under way in Oregon under the direct supervision of Mars E. Slack, temporarily loaned by the Oregon State Forester. Plans were nearing completion also for instituting the same process in Washington.

In addition to this a field party was started out to continue the work of making detailed field analyses of the results of large fires which was begun last fall and suspended during the winter season. E. L. Vose and L. E. Tucker are assigned to this phase of the study as temporary assistants and are now working in Cowlitz County, Washington. It is anticipated that this will require about three months' time, since probably at least four more counties will be covered.

Routine work during the month was directed mainly toward further refinement and clarification of purposes and methods with respect to details other than those mentioned above.

Economic Aspects of Forestry

Kirkland and Brandstrom prepared a detailed working plan for this project, spending some time in Portland in order to confer with members of this office and the Regional Office. Field work commenced late in the month with one crew making logging time studies on the Chas. R. McCormick operation. Brandstrom has lined up other locations for this study and been met with a cordial response from the operators in every case.

General

J. A. Putnam joined the Station staff on February 1st and was assigned to the Hardwood Survey. Putnam was attached to the Station in 1928 as Field Assistant and worked with Lentz on the extensive survey of the bottomland hardwoods of Louisiana. He has returned to the Station after more than two years of practical woods work as forester for the Thistlethwaite Lumber Company of Opelousas, Louisiana. Putnam's knowledge of hardwoods and his familiarity with logging methods and grading rules for hardwood lumber will make him an exceptionally valuable man for the Survey.

Management

Wahlenberg, Chapman, and Olsen spent the entire month on the Ouachita National Forest in Arkansas making a preliminary reconnaissance for the selection of an experimental forest area for the Southern Station. The extreme irregularity of the stands made it difficult to find an area that, by itself, could be considered typical of the national forest as a whole. A number of prospective areas were examined and observations on growth were made on two watersheds that seemed particularly suitable as experimental forest areas.

Forestation

Wakeley worked practically the entire month on current germination tests and in analysing previous germination work needed to fill gaps in the Forestation Bulletin. Wakeley also sacked the flowers on a hybrid pine and on a number one breeding tree near Bogalusa, Louisiana.

Using data collected at Camp Pinchot, Gemmer failed to find any significant correlation between amount of radiation or wind velocity with tree growth. However, there seemed to be some association between evaporation and tree growth.

Naval Stores

The second group of 100 longleaf trees in the advance streak test was chipped during the second week of February. The fire line construction at Kingsley Lake was completed.

Sample of tacks were received from the Atlas Tack Company and were tried out and found unsatisfactory because they failed to puncture the heavy galvanized metal used for gutters.

A small set of tools such as are used in the turpentine industry in Sumatra, Dutch East Indies, was received through the courtesy of American Consul General Coert du Bois, formerly of the U. S. Forest Service.

Averell and Heyward were on Extensive Surveys in South Carolina and Georgia for the whole month. Diller was with the party until the 19th, when he was replaced by Busch. A considerable amount of information on chipping and other naval stores practices was collected. A number of soil samples were sent in to Dr. Barnette for analysis, and contacts were made which may enable the Station to establish a set of yield tests on burned and unburned timber in two localities in southern Georgia.

Considerable progress was made on summarizing and completing the records of the 1926-1930 tests.

Two samples of longleaf seedlings from seed collected from trees at Kingsley Lake, one of them being an exceptionally high yielding tree and the other an exceptionally poor one, were turned over to the State Forester's organization and planted by Mr. Coulter at Raiford. Some maritime pine seed was also furnished the State Forestry Department.

Financial Aspects of Private Forestry

The Economics crew spent most of the month in the office working on the various Florida and Arkansas county reports. During the month Dr. Ziegler made a 4-day reconnaissance trip through southwest and north central Louisiana with Dr. Thomson, Economist of the Louisiana Agricultural Experiment Station, to locate areas suitable for a joint study. Bond and Reynolds spent the latter part of the month in Hempstead County, Arkansas checking over and supplementing the data collected last summer. A land classification as to timber types and land uses was made for the first time by using a crop meter.

Erosion

Sinclair worked on plans for the spring planting of a number of species in an attempt to control erosion on several areas in northern Mississippi. About a week was spent in the field in securing cooperation of land owners for this work.

Hardwoods

Winters and Bull spent practically the entire month with the Hardwood Forest Survey group making plans and perfecting procedure for the Survey.

Forest Survey

The men on the Hardwood Survey Staff divided their time between office and field work. Mr. Granger and Mr. Girard were at the Station during the greater portion of the month and devoted most of their time assisting in the formulation of a working plan for the bottomland hardwood survey.

Girard and Putnam made up volume tables for red gum and various other hardwoods, using the data collected by Lentz and Putnam in 1928. By inspection Girard found that there was a distinct and fairly uniform relation for any one species between the D.B.H. and the D.I.B. at the top of the first 16-foot log. A percentage figure for trees in different diameter classes was arrived at which, when multiplied by the D.B.H. would give the D.I.B. at the top of the first log. The data also showed that the taper above the first log was quite uniformly 2 inches per 16 feet. Using these relations, a Scribner Decimal "C" volume table based on D.B.H. and log lengths was worked up. It was found that this volume table checked very closely with the actual volume of the trees measured.

During the week of February 8th, Demmon, with all of the men on the Hardwoods and Survey staff, were in the field working out a procedure for the Survey. In northern Louisiana trial strips were run and sample plots tallied in virgin, second growth, and cut-over areas. Notes were taken on all field procedure and these were later incorporated in the working plan by Lentz.

On the Willow Bayou tract of the Ashley Estate in Madison Parish, Louisiana the disastrous effects of a fire in the bottomlands were noted. This area, originally a virgin gum stand, was logged in 1927 and 1928. In February, 1931, the greater part of the 1927 cut-over area had been recently burned. Most of the young reproduction was dead and even some of the larger residual trees were very badly burned. This was but one of several areas seen in the bottomlands where winter fires were burning with no attempt being made to check them. The winter season of 1931 may prove as serious from a fire damage standpoint as the fall of 1924 and spring of 1925 when a large percentage of the forest area in the bottomlands burned over.

Forest Pathology

Routine spraying of seedling longleafs near Bogalusa, Louisiana was carried on throughout the month. At the same locality an estimate was made of the amount of the brown-spot needle disease in a series of plots where spraying to control the disease is begun at each successive two-week interval.

A trip was made to the Louisiana State Nursery where Asiatic Chestnut seedlings had been growing for nearly a year. About six thousand seedlings

divided between Castanea mollissima and Castanea japonica were shipped from central Louisiana for planting in twenty-six localities in nine southern states.

A slash disposal area on the Ouachita National Forest was examined and pictures taken to show the condition of the slash, which is now sixteen months old.

A small scale dipping test was dismantled at Picayune, Mississippi with very satisfactory results from the standpoint of eliminating certain ineffective chemicals from future dipping programs.

A progress report summarizing the results of the recent work on log sprays and end coatings was completed and turned over to the American Pitch Pine Export Company, cooperator in the study, for distribution to member mills.

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SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION

Forest and Range Influences

Cooperrider visited our neighboring Region in California from February 8 to 20, and attended the National Water Users' convention, which convened in San Francisoo February 9 to 11. Cooperrider gives the following account of his trip and of the convention:

"Lowdermilk and Chapline were scheduled to present papers on the erosion question before this convention. Since Chapline was detained in Washington, I read his paper and briefly discussed the result of watershed studies in Arizona, illustrating the main points with lantern slides.

"The place of the watershed in developments for irrigation, power, and other like uses of water and the management of the watershed to secure a sustained yield of usable water was stressed in the discussions.

"Among the resolutions passed by the convention were two dealing with watershed and erosion. One urged the recognition of the watershed as an integral part of the development using water, and a management of watersheds that is in accord with such recognition. The other was in support of research on the various factors involved so that watershed management on a factual and not a conjecture basis may be assured.

"Following the San Francisco meeting, a very stimulating day and a half was spent at the California Station and University at Berkeley.

I was here able to go over Lowdermilk's field installations for the study of erosion, to make this trip with him and to benefit by his discussions. The installations visited were scattered from the North Fork on the Sierra forest to San Bernardino. It was a most interesting and instructive week. Lowdermilk is going a long way in segregating the problem into its parts and in the development of methods that will give a measure of the influence of the part.

"The tremendous values of water, the importance of usable water, the necessity of adequate management of watersheds and waterflow become more and more impressive when one compares the scope of developments throughout the Southwest and Southern California. Within this Region are developments that are new and also those that are old, those that are defunct and those that probably represent the highest urban advancement of past of present, yet maintenance of present standards and the possibilities of the future are dependent upon water supply and its delivery in a usable form. One can not help but wonder whether the new will profit by the experiences of the old; whether the attainments through watershed management will keep pace with the requirements for water delivery; whether research will be able to furnish and to sell the facts; and above all, will each of these be accomplished in due season, or is the desert to slowly win back its own.

"A most important matter in the whole scheme of things would seem to be that of land use. One hears much of marginal lands in connection with regular agriculture. Water supply and delivery, and the usable character of water are things which obviously determine the extent of economic development by irrigation. Development beyond the stage made possible by permanent water supply is certainly marginal in character. When single watersheds are considered, there are many instances where dry farming that might have been practiced in the part of the valleys devoted to marginal farming by irrigation has been pushed back on hill-land to soon create a flood and ersosion menace affecting the adjacent valley land highly developed by irrigation. Such hill-lands must be recognized as marginal farm lands for they soon pass out of economic production because of soil disturbances, yet they are on the watershed to remain as a constant menace to the valleys. Conservatively managed, these hill-lands might have been maintained as valuable pasture lands, or if the cover of vegetation is not of value for forage they might well have been considered a part of the valley development necessary for protection or control as a dyke, levy, or fence would be considered. Very frequently, good range lands have been taken out of production by marginal farming or destructive range use. Such practices, rendering temporary returns, have had much to do with subjecting lands to range use that are not suited to economic range production. Such lands are as truly marginal for range stock production as are certain other lands for farm production.

"The question of land maintenance and continued production makes it necessary to consider the adaptability of land to any particular uses. A suitable adaptation of all land uses on the watershed is of

particular importance to the lasting success of a reclamation project and the region in which it is situated because land unsuited to the use to which it may be subjected not only becomes unproductive, but becomes a manace to the developments depending upon water delivery. Is it not important that full recognition be given the apparent fact, until it has been proven otherwise, that present values of certain parts of the watershed may be entirely that of the water they deliver and the protection they afford, and that such lands may be marginal in character in so far as use for forage and timber production is concerned just as other lands are recognized as marginal farm lands?"

Forest Management

In the fall of 1930, two adjacent plots of western yellow pine, one a virgin, and the other a cut-over stand, were re-measured. Since the two plots are very similar as to soil, topography, and original stand, a comparison of increment and mortality is of interest. Each plot contains 160 acres. The plot in the virgin stand was established in 1920, and that in the cut-over stand in 1925. The results in Tables 1, 2, and 3 are for the 5-year period, 1925-1930.

The net increment on the cut-over plot (S7) greatly exceeds that on the virgin stand plot (S6.) The ratio based on cubic feet is 1.70 and based on board feet it is 1.26. Corresponding ratios for increment per cent are 4.55 and 4.40. These figures show that in the virgin stand we have a large wood capital producing a lower return in actual volume than a relatively small wood capital in the cut-over stand. In the virgin stand there is an actual decrease in volume of trees above 30 inches in diameter due to high mortality. From this it might be deduced that no trees over 30 inches in diameter should be retained; but this might not be true if the trees retained are thrifty. Note that among the trees over 30 inches in diameter on the cut-over plot, there was no loss at all during the 5-year period. Generally, however, the mortality in this class is higher than in the lower ones, even though only thrifty trees are concerned.

In the diameter group between 21 and 30 inches, the percentage of mortality is actually greater on the cut-over plot than on the virgin plot, the ratio being 1.42. In the 12-20 inch diameter group both absolute and relative mortality are nearly equal in the virgin and cut-over stands. Another interesting fact is that for trees in the 12-20 inch group the volume retained is almost the same on both cut-over and virgin stand plots.

Omitting the trees below 12 inches and above 30 inches in diameter, the increments in board feet are not far apart. A net increment of 83 board feet (including "new" trees) took place on the virgin plot and 96 board feet on the cut-over plot. The gross increment is 105 board feet for the virgin stand and 106 board feet for the cut-over stand.

If the uncut plot in this study is representative of virgin stands in general, it would seem that there is no justification for hastening cutting operations on the grounds that virgin stands are deteriorating. It is true that the increment per cent is low and that mortality is great, but the actual wood increment should be the guiding criterion. On the other hand, when conditions are right for cutting, it should be recognized that a stand so cut as to leave a good growing stock of thrifty trees will produce more net increment than a mature virgin forest.

Diameter growth on the cut-over area as compared with the virgin stand shows considerable acceleration due to cutting. The 4-11 inch class seems to be an exception. This is probably due to the fact that most of the small trees are in groups somewhat removed from the old trees. Evidently these young trees are not seriously affected by root competition from the older ones, even in the virgin stand. On the other hand, there is keen competition within the young tree groups, in virgin and cut-over stands alike. The groups of young trees are somewhat larger in the cut-over stand.

It is of interest to note that in the cut-over stand 50% of the trees over 30 inches d.b.h. grew an average of 1 inch in diameter. Although considerable mortality must be expected in trees of this size, they will grow if of good crown development, assuming that ample growing space is provided.

Table 1 - Increment in a Virgin Stand of Western Yellow Pine -

(based on 5 year record of Sample Plot S6 - 160 acres.)

Diam. Classes	Stand per acre in 1925	Mean Annual Increment Per acre Net	mortality	Gross	Mean Annual Increment Per cent Net	mortality	Gross
inches	cu. ft.	cu. ft.	cu. ft.	cu. ft.	%	%	%
4-11	34	2.5	0.05	2.55	7.35	0.15	7.50
12-20	317	5.6	0.50	6.10	1.77	0.15	1.92
21-30	1,132	6.9	3.50	10.40	0.61	0.31	0.92
31-40	605	(-1.3)	3.50	2.20	(-0.22)	0.58	0.36
41 & over	57	(-0.5)	0.60	0.10	(-0.88)	1.05	0.17
Total	2,145	13.2*	8.15	21.35	0.62	0.38	1.00
4-30	1,483	15.0	4.05	19.05	1.01	0.27	1.28

*0.8 cubic feet to be added for "new" trees.

Classes	Stand	Net	Mortality	Gross	Net	Mortality	Gross
inches	ft. B. M.	ft.B.M.	ft. B. M.	ft.B.M.	%	%	%
12-20	1,351	31	2	33	2.29	0.15	2.44
21-30	6, 374	47	20	67	0.74	0.31	1.05
31-40	3,702	(-6)	21	15	(-0.16)	0.57	0.41
41 & over	378	(-3)	4	1	(-0.79)	1.06	0.27
Total	11,805	69*	47	116	0.58	0.40	0.98
12-30	7,725	78	22	100	1.01	0.29	1.30

5* board feet to be added for "new" trees.

Table 2 - Increment in a Cut-over Stand of Western Yellow Pine -

(based on 5 year record of Sample Plot S7 - 160 acres.)

Diam. Classes	Stand per acre in 1925	Mean Annual Increment Per acre			Mean Annual Increment Per cent		
		Net	Mortality	Gross	Net	Mortality	Gross
inches	cu. ft.	cu. ft.	cu. ft.	cu. ft.	%	%	%
4-11	114	8.1	0.17	8.27	7.10	0.15	7.25
12-20	319	9.5	0.48	9.98	2.98	0.15	3.13
21-30	329	4.5	1.45	5.95	1.37	0.44	1.81
31-40	35	0.4	0.00	0.40	1.14	0.00	1.14
41 & over	-	-	-	-	-	-	-
Total	797	[illegible]*	2.10	[illegible]	[illegible]	0.26	3.08
4-30	762	[illegible]	2.10	[illegible]	[illegible]	0.28	3.18

*2.5 cubic feet to be added for "new" trees.

Classes	Stand	Net	Mortality	Gross	Net	Mortality	Gross
inches	ft. B. M.	ft.B.M.	ft. B.M.	ft.B.M.	%	%	%
12-20	1,361	54	2	56	3.97	0.14	4.11
21-30	1,842	30	8	38	1.64	0.44	2.08
31-40	215	3	0	3	1.41	0.00	1.41
41 & over	-	-	-	-	-	-	-
Total	3,416	87*	10	97	2.55	0.29	2.84
12-30	3,203	84	10	94	2.62	0.32	2.94

*12 board feet to be added for "new" trees.

Table 3 - Diameter Growth of Trees in Virgin and Cut-over Stands of Western Yellow Pine -

(based on 5 year record of Sample Plots S6 and S7.)

Diam. classes	Mean Annual diameter increment per tree		Ratio Cut	Number of trees	
	Virgin	Cut	Virgin	Virgin	Cut
inches	inches	inches			
4-11	.194	.190	.979	1,614	5,562
12-20	.105	.170	1.65	1,352	1,698
21-30	.081	.142	1.75	1,386	500
31-40	.054	.134	2.48	328	21
41 & over	.03	-	-	18	-
Total	.124	.182	1.47	4,698	7,781

Santa Rita Experimental Range

An all important phase of the Santa Rita Clipping Study, and one which promises a considerable amount of information that can readily be applied on the ranges of the Southwest, is that which deals with the yearly variation in the growth and production of native range grasses in response to varying rainfall and different systems of use- the latter being simulated by different frequencies and degrees of clipping. The study was started in 1925 and has been continued up to the present time, thus covering a six year period that for all practical purposes represents a fair average of rainfall conditions with the single exception that no really serious summer drouth has been experienced; however, this is largely made up for by the fact that the year 1925 immediately followed the severe drouth of 1924 and our experience has shown that much of the effect of drouth does not show up until the year following. (The low production recorded for 1925 in the table below shows very clearly the drouth influence.)

A series of permanently marked meter square quadrats was used in the study with a certain frequency and degree of clipping prescribed for each quadrat through the summer growing period of each year. A complete set of quadrats was established in each of the mesa and foothill types of range and being rather closely assembled at each location it can be assumed that such factors as temperature, rainfall, soil conditions, etc. were identical and that the only variable would be that of the clipping frequency and degree employed.

In order to illustrate the variation due to degree of use a comparison will be drawn between the quadrat clipped monthly at two inches and that clipped weekly at one inch, the former representing a rather conservative system of summer use and the latter continuous heavy use. In actual grazing practice removal of the vegetation once a month down to two inches would represent a much heavier usage than that occasioned by yearlong conservative use and were it possible to accurately simulate the latter an even more striking comparison than that given below should result.

The table below shows actual yearly production (in grams) of four important grass species in the foothill type under simulated conservative summer use as compared to continuous heavy summer use. (The production of all four species together representing the total volume on a square meter.) Yearlong rainfall - October of the previous year to September of current year - is given for comparison of variation due to this factor.

	Year	1925	1926	1927	1928	1929	1930	Total	Average
	Rainfall	9.24	21.31	16.43	11.14	20.54	17.14		
Bf*	Conserv. use	833	1,245	2,283	1,101	1,809	1,970	8,741	1,457
	Heavy use	317	387	1,285	448	840	2,087	5,355	892
Bb	Conserv. use	41	497	1,223	1,342	2,986	2,673	8,762	1,460
	Heavy use	264	1,022	1,688	1,158	2,390	2,361	8,883	1,481
Cm	Conserv. use	78	265	470	530	446	540	2,329	388
	Heavy use	222	189	327	238	278	415	1,669	278
Hg	Conserv. use	165	897	1,482	1,114	1,008	1,046	5,712	952
	Heavy use	222	234	448	172	92	281	1,449	241
Bf Bb Cm Hg	Conserv. use	617	2,904	5,458	4,087	6,249	6,229	25,544	4,257
	Heavy use	1,025	1,832	3,748	2,016	3,600	5,144	17,358	2,892

*Bf - Bouteloua filiformis - Slender grama Hg - Bouteloua hirsuta - Hairy grama

Bb - Bouteloua chondrosioides - Ring grama Cm - Hilaria belangeri - Curley mesquite

The influence of rainfall on production is clearly manifest although not always in direct proportion to the amount, due to conditions of the previous year as well as to current seasonal distribution and effectiveness of rainfall. Production in 1925 reflects the drouth of 1924 as well as relatively short current rainfall. The two years following show a decided increase in response to more nearly average rainfall conditions while 1928 shows on the whole a noticeable drop in production followed in turn by an increase up to 1930. The relatively low rainfall of 1928 caused a slight decrease in production over 1927 generally, although ring grama and curley mesquite under conservative use increased slightly. In the case of curley mesquite and hairy grama the influence of low rainfall in 1928 was reflected in a small decrease in 1929, followed in 1930 by a relatively small increase.

On the whole, curley mesquite and hairy grama appear to recover from subnormal rainfall conditions rather more slowly than either of the other species especially when continuous heavy use is prevalent. The value of a mixed grass range is evident in that the species which recover more rapidly will compensate for those that are lower and vice versa; those that decline quickly will be made up for by the species that are more resistant to the effects of adverse rainfall.

Perhaps the most striking feature of the results presented is the extreme variation in production one year with another. Even in an average run of reasonably good years - such as the period from 1926 to 1930 inclusive - the production of the better years is double that of the poorer ones. The difference between drouth years and good ones is so extreme as to be almost unbelievable. Previous studies have indicated similar results for local areas. On large range units there are compensating variations that would reduce this difference somewhat although certainly never to the point where it would be anything but a decidedly important consideration in range management. (To be continued.)

Jornada Experimental Range

The outlook for spring pasture continues to be the most favorable for several years. Frequent rains which total 1.52 inches for the month appear to be general for the region. A test pit at the Jornada headquarters shows that the moisture has penetrated the soil to a depth of four feet. Moisture is seldom found four feet below the surface at any season of the year.

Cattle are in excellent condition throughout the region. Death loss has been low this month and there are no indications that it will increase to any great extent as spring advances.

The Jornada Road Program is going along in good shape. A new caterpillar "30" tractor and an Adams "10" grader were delivered to the Jornada early in the month. These machines seem to be just about the

right combination for our road construction. The crew has cleared twelve miles of right-of-way, constructed "graveled dips" on ten miles of road, and the re-grading of six miles of road is practically completed.

Campbell reports that he arrived in Washington a day ahead of his schedule. He gives the credit to his new Ford.

Canfield's time has been rather thinly spread over the routine incident to the Las Cruces office, the Jornada headquarters and the road projects.

Bomberger is making good progress with the analysis and writeup of the Snakeweed Study. The rough draft of his paper gives promise of a very interesting completed report.

S. E. Aldous of the Biological Survey and M. E. Musgrave of the Region 3 office of the Forest Service were callers at the Las Cruces office during February.

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ROCKY MOUNTAIN FOREST EXPERIMENT STATION

Much of the work performed in the Experiment Station office during February was in the nature of routine, which had accumulated during the period when attention was focused upon completing the investigative report and presenting it before the Regional Investigative Committee.

The report and program were assembled in the Regional Office early in the month and submitted to the Forester. At the same time, the individual project memorandums with recommendations were mailed to the various Supervisors.

Roeser spent about three-fourths of his time in the office. It was necessary for him to spend six days at Fremont due to Williamson's enforced absence. At the field station, in addition to the routine observations, one plot in Block A of the experimental forest was mapped, tagged and measured, thus completing the preliminary work incident to placing the area under regulation. Germination tests of the commercial seed lots which are to be sown at the Bessey Nursery, Nebraska Forest, in the spring were started. Several lots of evaporimeters, including those used by the Northern Rocky Mountain and Northeastern Experiment Stations, were re-equipped and calibrated. Time was taken to work over the meterological equipment at Station F-1 (the cooperative weather station maintained by the Experiment Station), several elements of which were much in need of repair and adjustment. The various Nebraska and Black Hills experimental

western yellow pine cone lots, collected in September, which have opened very slowly and poorly were threshed during the period and analysis made of the seed lots.

In the office, considerable time was given to reviewing various strip survey administrative growth study reports for the spruce type, including reports from the Uncompahgre, Holy Cross and Rio Grande Forests. These are now being revised and put into final shape. Following approval of these reports, they will be sent to Supervisor Pearce, who has been assigned the job of assembling the different reports and coordinating the data. Most of his time during the month was given to this work, and every effort is being made by the Experiment Station to assist in bringing this undertaking to completion as quickly as possible.

Volume table data were received from the Cochetopa to be used in preparing tables for the various lodgepole pine thinning plots on this Forest. It was not possible, however, to do anything with this material during the month.

It was anticipated that, following the investigative meeting, circumstances would permit of a definite attack being made to initiate the task of summarizing the growth and increment results which have been obtained on the numerous management study sample plots within the Region. This plan failed of consummation and is now included in the March program of work. Under existing conditions, interruptions in the regularly scheduled plans affecting Experiment Station projects are to be expected if Research is to function at all in its advisory capacity to the administrative organization. In view of the heavy Regional program of administrative studies, this duty must be recognized by Research, and given whole-hearted consideration.

The contemplated trip to the proposed South Park erosion study area on the Pike Forest was postponed because of adverse weather conditions which prevailed during the month in the Park. Roeser, representing the Experiment Station, has been requested to accompany Pike officials in order to study the situation on the ground and to help formulate a working plan for a study similar to the one now being conducted near South Platte. It is planned to institute the experiment as early as possible in the spring.

Forest Rangers Wm. H. Pletcher and Marvin L. Smith, the former of whom reported for duty late in January and the latter on February 3, were assigned to compilation work in the Colorado Springs office. Their first job consisted in completing the tabulation of the 1928 meteorological data obtained in the type study; this work having been the subject of spasmodic attack for the past two years. At the end of the month, they were engaged in compiling stand and increment data and preparing tables for the spruce type cutting methods study on the old Leadville Forest Lake Fork sample plots. This particular task will be completed early in March.

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MANUSCRIPTS

APPALACHIAN

Biological Work at the Appalachian Forest Experiment Station, Address by T. D. Burleigh before the A.B.C. Club.

NORTHERN ROCKY MOUNTAIN

The Stocked Quadrat Method of Sampling Reproduction Stands, I. T. Haig. (For. Jour. of For.)

PACIFIC NORTHWEST

Statement for the Forest Research Council Concerning the Work of the Pacific Northwest Forest Experiment Station for 1930 and plans for 1931.

Direct Seeding in the Fog Belt - First Progress Report on Direct Seeding Done in January, 1929, 1930 and 1931. L. A. Isaac.

Working Plan for a Study of Selective Logging as Applicable in the Douglas Fir Region. Alex J. F. Brandstrom and Burt P. Kirkland.

The Effect of Atmospheric Humidity on the Moisture Content of Forest Materials. (For. Jour. Agr. Res.)

Climatological Data 1911-1930, Wind River Station, Wash. A. G. Simson

IN PRINT

Bates, C. G.	Chaining the Father of Waters. (Am. Forests)
Demmon, E. L.	Hardwood Research at the Southern Forest Experiment Station. (Southern Lumberman, Dec. 15, 1930.)
Stickel, Paul W.	Rev. of: The Evolution of Soils as Affected by the Old Field White Pine - Mixed Hardwood Succession in Central England, by Griffith, Hartwell, and Shaw. (Jour. For. March, 1931)
Zon, Raphael.	The Society Comes of Age. (Jour. of For. Mar. 1931)
" "	Forestry and the Economic Crisis. (Am. Forests)

Meyer, Walter H.
and Washington Office. Volume Tables and Volume Alinement Charts for Western Yellow Pine on Sites II, III, IV, V, and VI. (Mimeographed.)

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Extensive Revision - Capper Report

The job of assembling and revising the available information on the area, stand, growth and drain within the forests of the States of Idaho and Montana has been assigned to the Regional Offices of Management and Products and the Northern Rocky Mountain Forest Experiment Station. Region Four will be called on to furnish the latest available information on these subjects for Idaho south of the Salmon River. The Office of Management plans to secure the figures on area and stands within the National Forests of the two states and to secure the figure on the annual drain on the forests from abnormal disease and insect losses. The Products Office will assemble and revise the area and stand figures for all the forest lands not in National Forests and obtain the annual drain from cutting figures. The Experiment Station will assemble and revise the growth figures for all forest lands within the two states. The annual fire losses will be obtained from the Regional Office of Operation.

The several forms to be used in recording the data were received late in February and the work of assembling and revising the information called for is now under way.

Lumber Manufacturing Cost Trip Planned for March

The annual visit to the band mills of the Inland Empire region to secure detailed information on the cost of logging and lumber manufacture has been scheduled for the middle of March. As has been the plan in the past, Regional Logging Engineer Philip Neff and M. Bradner of the Products Office will make the trip together. It is planned to visit the head offices of thirty of the lumber companies within the region. Production costs are thus obtained from practically every band mill in the Inland Empire. Besides the cost figures, much additional information is obtained on conditions within the industry and personal contact is again made with the lumbermen.

Census

Returns from the first request to Idaho and Montana mills continued to come in at a good rate throughout the month. Approximately 48 per cent of the North Idaho and Montana production schedules have been received. The first consignment of South Idaho schedules was received from the Regional Forester at Ogden on February 13. This lot included returns from 34 per cent of the South Idaho mailing list.

All incoming schedules have been checked and in cases where additional information was needed letters were written to the operators

concerned. Most of the stumpage and log price reports received with the other returns for 1930 include information of value and a large number of important transactions have been reported.

Logging and Milling

The average tree for the three yellow pine tree studies made in Region One was 24 inches d.b.h. and scaled 680 feet gross log scale. Table 8 of Mr. Gibbons' article in The Timberman "The Effect of Tree Sizes on Western Yellow Pine Lumber Values and Production Costs," indicates that the average yellow pine tree for the Shevlin-Hixon tree study in R-6 was also 24 inches d.b.h. It scaled 670 ft. gross log scale. The following table gives a comparison of lumber yield for this average 24-inch tree between the four studies and between the Shevlin-Hixon study and the weighted average of the three Region One Studies. The Region One average 24-inch tree yields 23.90% selects compared to 9.11% for the Shevlin-Hixon, or a difference of 14.79% in favor of the three western Montana studies as compared to one eastern Oregon study. Grading for all four studies was in accord with Western Pine Manufacturers Association grading rules for Pondosa pine.

COMPARISON OF LUMBER YIELD
FOR 24" Y.P. TREES

	Selects			Common					Shop			
	B &Btr.	C	D	No.1	No.2	No.3	No.4	No.5	No.1	No.2	No.3	Inch shop
	%	%	%	%	%	%	%	%	%	%	%	%
Shevlin-Hixon	.67	5.06	5.38	2.53	33.12	30.14	7.12	.91	1.26	8.51	3.25	4.05
Heron	7.20	4.10	14.40	.00	23.20	36.10	2.60	1.20	.60	1.00	.80	2.30
Harper	5.90	5.80	12.30	1.00	33.90	21.60	3.60	.30	2.90	6.50	3.80	2.40
J.Neils	6.30	6.90	9.70	1.70	25.70	39.70	4.90	.10	.50	.90	1.60	2.00
R-1 Av.	6.30	6.00	11.60	1.00	27.90	33.10	5.50	.40	1.20	2.70	2.20	2.20

Woods Waste Survey

Office work has been completed for the white pine type. A manuscript covering this type has been completed by Mr. Anderson and it will be published in the next issue of The Timberman. Office work for the survey of the yellow pine, larch-Douglas fir and lodgepole pine types will be completed before April 1 and the manuscripts submitted to The Timberman for publication. The yellow pine type will be dealt with in a separate article while the larch-Douglas fir and lodgepole pine data will be combined.

Miscellaneous

Mr. Uderitz, representing the U. S. Tariff Commission was a visitor in the Office during the last few days of the month. Mr. Uderitz had just completed his survey of the lumber industry within the Inland Empire and the adjacent territory in Canada and was on his way back to Washington, D. C. The Office of Products and Logging Engineering assisted Mr. Uderitz in rounding out his knowledge of the region as a whole and in helping him divide the region into units based on comparable production costs and markets.

Lumber Prices & Movement

Av. Mill-Run Prices	Annual 1929	Annual 1930	January, 1931
Idaho White Pine	$34.33	$33.56	$31.50
Western Yellow Pine	26.19	21.64	17.56
Larch-Fir	20.29	17.32	14.50
White Fir	20.94	16.34	13.87
Spruce	24.23	21.93	18.50

Shipments and Cut	1930	1931
Shipments	106,193	84,362
Cut	85,765	50,317

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FOREST PRODUCTS - Region 6

Pacific Northwest Research Council Meeting

In Mr. Gibbons' absence the Office of Products was represented at this meeting, held on February 27, by Hodgson. The progress of work being conducted by Products was discussed and the plan of work as outlined for 1931 was approved by the Council.

Survey of Sawmill Waste in the Douglas Fir Region

All of Hodgson's time, with the exception of that spent in handling the administrative work of the office as a result of Mr. Gibbons' absence, was devoted to this project. The administrative work during February was

abnormally heavy on account of the meetings of the Pacific Northwest Research Council and the Regional Investigative Committee meetings which the Office of Products was called upon to prepare for. Notwithstanding these and other interruptions, however, very good progress was made with the office work of the survey of sawmill waste.

The following tables, representing the final summary of the statistical data, are representative of what the study is bringing out.

Table 1 - Disposition Made of So-called Sawmill "Waste" by the Sawmills of Western Oregon and Washington - 1929

	Quantity	Per Cent
	M ft. b.m.	
Approximate amount of lumber produced - 1929[1]	10,258,344	
	Cu. ft. Solid Measure	
Sawmill waste recovered and sold as by-products	271,634,288	44.0
Sawmill waste sent to boiler room for the production of domestic power	177,798,424	28.8
Sawmill waste sent to refuse burner and destroyed	167,815,280	27.2
Total production of "normal"[2] sawmill waste	617,247,992	100.0
"Normal" sawmill waste resulting from the production of 1000 ft. b.m. of rough, green, lumber	60.17	
Material in excess of "normal" sawmill waste such as planer shavings, remanufacturing-plant waste, cull logs sent through mill for the production of hogged fuel, etc. Converted mostly into hogged fuel and sold as such as reported by the sawmills on questionnaires	103,506,939	
Total quantity of normal sawmill waste and remanufacturing plant waste, not including remanufacturing plant waste sent to boiler room and refuse burner	720,754,931	

[1] Only approximate figures used simply as the basis for a ratio between sawmill waste and lumber produced.

[2] "Normal" sawmill waste is the waste wood, bark and sawdust resulting from the production of rough-sawed, green, lumber by sawmills operating under normal conditions. One large mill, for example, reported much more than normal waste and upon investigation it was found that in order to meet its contracts for hogged fuel the company was running large numbers of very low-grade logs through the mill for the production of hogged fuel only. Other companies reported remanufacturing plant waste on the questionnaires which could not be classed as "normal" sawmill waste as the term is used.

Table 2, - The Sale Value of So-called Sawmill "waste" in the Form of By-products in Western Oregon and Washington - 1929

Kind of By-product recovered from so-called sawmill waste	Quantity	Unit of Measurement	Average unit price	Selling price at the sawmill
Lath	721,617	M pieces	$ 3.15	$ 2,272,547
Handle Squares	28,536	M pieces	7.33	209,096
Shingle Bands	21,228	M pieces	2.90	61,575
Pulp wood	213,336	Cords	2.97	633,384
Pulp chips	225,333	Units[1]	2.09	470,150
Fuel wood	1,447,135	Cords	1.61	2,335,272
Hogged Fuel	922,156	Units[1]	.92	844,131
Sawdust	289,086	Units[1]	1.07	308,063
Other By-products	-	-	-	9,859
Total	- - - - - -	- - - - - -	- - - - -	7,144,075[2]
Material in excess of "normal" sawmill waste reported by the sawmills as sold. Planer shavings, remanufacturing-plant waste, cull logs, etc. converted mostly into hogged fuel and sold as such - - - - - -

These tables represent the summary for the entire region. Other similar tables will summarize the data by states and by economic regions. The latter will coincide with those to be used by the Forest Resource Survey so that the sawmill waste statistics will be easily available for use by that survey if they are desired. The data have also been tabulated by counties. It is found that when the statistical information is broken down into the smaller geographic units some very interesting comparisons, as to utilization of waste as by-products, value at the mill of such by-products, and amount of waste still being sent to the refuse burners in the various geographic units, are shown.

The writing of the preliminary draft of the office report has been started by Hodgson. The outline for the report has been prepared and several of the main topics have been roughly covered. One chapter, which may also be prepared as a separate report, is being devoted to conversion factors which relate to sawmill waste. Prior to the beginning of the survey, very little about sawmill waste ratios were known and it is believed that this subject, dealt with in a systematic way, will prove to be a valuable contribution.

Most of Rapraeger's time was also given over to this project in assisting with the compilations.

Felling and Bucking in the Douglas Fir Region

This study, due to Spelman's illness is at a standstill. Rapraeger has gone over the work with Spelman for the purpose of assisting in working up the data which has already been collected. There are certain data collected for this study which Kirkland and Brandstrom feel that they could use in connection with their project. These data will be compiled as soon as time is available.

Minor Forest Products Study

Johnson spent some time both in the field and office on this Minor Forest Products Study. Although some of the data is now being tabulated, the information secured is as yet more or less of a piece-meal character. One of the direct results of the study will be a very complete directory of producers of the various minor forest products, particularly pole and pile producers.

1930 Census of Lumber, Lath and Shingles

The bulk of Johnson's time was devoted to this project. During the month, 575 schedules were edited and are ready to forward to Washington as soon as the data are entered on the census cards. An additional 100 schedules were completed except for certain missing information, making a considerable amount of correspondence with individual companies necessary.

Address

On February 13, Hodgson gave a lecture entitled "Unusual Uses of Our Pacific Coast Woods", before the Oregon Audubun Society. The subject, which at first, to the speaker at least, seemed to be quite colorless, apparently appealed to the audience. A large collection of unusual products made from wood was exhibited and as each item was taken up for discussion a general resume of the manufacturing process used in its production was given. Since the Audubun Society is composed largely of extreme conservationists, an effort was made to establish the fact that true conservation of the forests is based on use, perpetuated.

Western Hemlock Used in the Manufacture of "Rayon" and "Cellophane"

It has been learned, on very good authority, that a large portion of the Alpha pulp now used by DuPont in the manufacture of rayon, cellophane and other similar products, is derived from western hemlock wood. The pulp used in this process is being supplied by one of the Pacific Coast pulp mills which is producing sulphite pulp made from pure western hemlock.

Persistent rumors indicate that a rayon factory is to be established on the Pacific Coast - probably in Washington.

Multnomah Mill Will be Changed into Pulp Plant

According to a recent newspaper item, plans are being completed for converting the Multnomah Lumber and Box Company plant, located at Portland, Oregon, into a wood fiber operation with a daily capacity of 50 tons. It will be operated under the name of the "International Pacific Pulp and Paper Company". The president of the company, Mr. F. A. Douty, is quoted as saying, "The entire output of the new plant can be absorbed in Portland and its trade territory, and no effort will be made for a while to exploit outside markets."

This will be the first pulp mill to be established in the immediate vicinity of Portland. The Multnomah Lumber and Box Company was organized in 1885 and has been operating a sawmill at its present site in Portland for the last 35 years.

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Program Conference

The annual program conference was held in Washington this year on February 10. Fairchild, Hall, Herbert, and Hiley represented the Inquiry staff. The preparation and publication of the comprehensive report of the Inquiry were discussed, and the latest revision of the outline for this report was reviewed. Plans for completion of the study of forest taxation in Europe were presented, including the desirability of a field study. These plans were approved subject to the obtaining of necessary authority covering foreign travel. Favorable consideration was given to the necessity of additional field work in a number of states, particularly in connection with the study of special forest tax laws, and also to the completion of about eight additional progress reports.

Studies of existing forest tax legislation

Immediately after the program conference at Washington, Herbert proceeded to New Orleans, where he was joined by Wager, in order to carry on this project in the states of Louisiana, Mississippi, and Alabama. Special attention is being given to Louisiana on account of the long experience of that State with special forest tax laws.

A report was received from P. T. Coolidge of Bangor, Maine, who was employed by the Inquiry on a temporary basis, to collect data bearing on taxation of forest and farm lands in that State. This report deals, in part, with the relation of taxes and assessed valuations to actual values.

DeVries has submitted an office report as a result of his part of the Maine project entitled "An Economic Study of the Local Political Organizations in the State of Maine with Special Reference to the Tax Burden and Resulting Land Utilization."

Office reports on the effects of existing forest tax legislation in Iowa, Ohio, and Indiana, were completed by Hall.

North Carolina project

A very detailed office report covering all phases of this project has been completed by Wager and Thomson. The use of this report, as a basis for one or more progress reports, is being considered. Application studies are being made by Thomson, using the data of the North Carolina report.

European studies

A report entitled "Taxation of Woodlands in Britain" was completed by Hiley. This report covers the subject very fully and will not need to be supplemented by any additional work. Hiley has reviewed the materials which have been obtained from various sources bearing on forest taxation in Germany and has started to do the same for France.

Miscellaneous

A progress report entitled "Resources and Public Finances of Michigan in Relation to the Forest Tax Problem" by P. A. Herbert was forwarded to Washington for publication, either in the usual form, or as the first of a Forest Service series of printed progress reports.

Hall attended, unofficially, the winter meeting of the New England Section of the Society of American Foresters at Providence on February 23 and 24. The subject of forest taxation was brought up at that meeting through the report of a committee, of which Hall is a member. The Section indicated that it would wait for the conclusions of the Inquiry before making any recommendations on this subject.

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